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CLINIC OF DR WILLARD BARTLETT

MISSOURI BAPTIST SANITARIUM

## SIX PATIENTS IN WHOM A THYROIDECTOMY AND A SECOND MAJOR OPERATION ARE INDICATED

SIX patients have been selected for this clinic with a special point in mind of illustrating one definite phase of the goiter problem in its relationship to maladies elsewhere in the body. There is food for thought whenever a goiter is encountered so extensive are the anatomic and physiologic derangements consequent upon its occurrence. This general statement will, I believe, not be disputed, but we go further than this today and find ourselves confronted by a matter of vital need when we consider 6 patients in whom there appear, in each of them, indications for thyroidectomy and a second major surgical operation. This aspect of the goiter problem has not to my knowledge received the critical consideration which it merits because, as our own experience would indicate such cases are not rare, and unless therapeutic requirements be met in the light of experience and reason instead of at random, I am convinced that the results will be faulty and the mortality abnormally high.

I believe we must in viewing this one aspect of the goiter problem take it for granted (as is always done in our clinic) that a thyroidectomy should never be performed at the same sitting with another major surgical operation, and must then consider each patient separately with two definite questions before us:

- (1) Which operation should be done first in the given instance?
- (2) What interval of time should be allowed to elapse between

these two major procedures? (The second question will of course automatically determine whether or not the patient shall be sent home between the two operative attempts or whether both shall be integral parts of one hospital stay) Of one thing I am perfectly certain namely that no general rule will answer these two questions for all patients however six major considerations which have evolved themselves out of our own clinical experience here tend to *help* us meet the two foregoing requirements for each individual who presents herself when needing a thyroidectomy and another operation Each of these six considerations will be illustrated by a clinical presentation

Consideration I—Operate first upon the lesion which is causing the more marked symptoms illustrated by Case I Mr W forty seven years of age presents himself complaining of dull pain in the right hypochondrium indigestion and a goiter

The history of present illness began after gall bladder operation four years ago with very mild attacks similar to those before operation In the past eight months patient has had four severe attacks characterized by a dull aching pain in the right hypochondrium referred straight through to a spot on the back not referred to lower abdomen or under shoulder blades attacks last from several minutes to several hours relieved by rest and opiates usually occur three or four hours after evening meal There is belching but no nausea or vomiting Abdomen distends bowels inclined to be constipated stools of normal color Urine very dark after attacks No jaundice or itching skin Before first attack fifteen years ago had chronic diarrhea since present trouble chronic constipation Patient has lost 11 pounds in eight months is unable to sleep No subjective symptoms of goiter except enlarged thyroid which is noticeable and slight nervousness

*Physical* The patient is 67 inches tall weighs 160 pounds Temperature is 97.8° F pulse 86 respiration 20 blood pressure 130/80 hemoglobin 78 Heart and lungs negative Urine yellow in color specific gravity 1025 reaction acid few cylindroids

Each thyroid lobe approximates in size a large lemon flattened, consistency is firm, surface is nodular, trachea and larynx are in midline; no thrills, bruits, or dilated vessels; no upper chest dulness and but slight tactile tremor is present. The examination of the abdomen is negative except for a bulging area the size of a large orange high right, which recedes when the patient lies down, presenting a firm fibrous ring the size of a dollar through which several exploring fingers can be projected directly into the abdominal cavity.

*Diagnosis.*—Postoperative incisional hernia. Adenoma of the thyroid.

*Recommendation.*—Herniotomy. Fascia transplantation, and, later, thyroidectomy.

*Discussion.*—For the past eight months he has been having attacks very similar to those which had led to the operation. He presents a large incisional hernia and a simple adenomatous thyroid which seems to be quiescent and making only very mild pressure symptoms. In view of the importance of the abdominal manifestations we elect to treat them first. We are, with the abdomen open, unable to find a trace of his gall-bladder; we explore his ducts and find no stones; we now dissect free and unite the borders of the ring with extra hard catgut, and transplant a graft of fascia lata over his entire weakened area.

There was in this case no doubt about which lesion was producing the more urgent symptoms, hence, there being no contraindication, we elected to repair the abdominal wall before doing anything on the thyroid.

*Supplementary Note.*—The convalescence from this operation was so slow that we did not feel justified by his condition in attempting anything on the neck during this first hospital stay. We sent him home for several weeks, after which he returned in splendid condition, having gained considerable weight. The thyroid was then removed six weeks after the hernia operation. A smooth and uneventful convalescence followed.

*Consideration II.*—Goiter should be removed at primary operation if by its presence it is likely to interfere with an



inhalation anesthesia required for another operation illustrated by Case II Mrs B thirty seven years of age enters the hospital with her complaint given as leukorrhœa choking and nervousness

The history of present illness began about six years ago with appearance of enlarged neck which continued to increase in size ever since No history of goiter in the family The source of drinking water six years ago was river water Patient is subject to choking sensations interference with breathing but no difficulty in swallowing There is a sense of pressure in the throat she has become very nervous knows of no etiologic factor in her case Menstrual flow very profuse there is also much leukorrhœa She has had spells of trembling palpitation of the heart also fast heart no vomiting diarrhea edemas or sweating There has been insomnia loss of strength much headache has had spells of hoarseness Has had pain in left side of abdomen

*Physical*—Her appearance is fair is 66 inches tall weighs 136 pounds Temperature is 99° F pulse 112 respiration 20 blood pressure 110/60 Heart and lungs are negative Urine amber in color specific gravity 1030 reaction acid Eyes reflexes teeth are negative lips red tongue very slightly swollen Thyroid greatly enlarged particularly left lobe which is size of fist right not palpable or visible but suspicious dulness under corresponding clavicle trachea deviates markedly to right no thrills or bruits heart not enlarged no abnormal sounds Abdominal examination shows wide costal angle skin all right moderate fat muscle tone all right no inhibition very tender low on both sides right kidney palpable left not rings all right perineal and vaginal conditions all right cervix high back medium sized fixed body large forward fixed tender fixed masses in both adnexæ has both external and internal hemorrhoids

*Diagnosis*—Salpingitis Toxic adenoma of thyroid

*Recommendation*—Thyroidectomy Later salpingectomy

*Discussion*—She has a mildly toxic adenoma of the thyroid and a double gonococcus pelvic abscess She is a woman in

early middle life whose thyroid symptoms, although characteristic of the condition, have not yet made definite organic inroads, even though she considers them much more urgent than her profuse menstrual flow, leukorrhœa, and lower abdominal pain. In this case a general anesthæsia for the relief of the pelvic condition is considered dangerous, hence the goiter is removed first.

We make a collar incision after carefully marking the neck so that a chain of beads will eventually cover the collar-like skin incision; then split midribbon muscle from hyoid bone to manubrium sterni, and in the customary manner free each upper pole first, remove in one block this goiter having its left lobe about the size of my fist and its right lobe the size of a hen's egg. It is seen to be sbot through with adenomata varying in size from a buckshot up to a hazelnut. There is no bleeding at all as the suture ligation is completed. The degree of toxicity in this instance is slight, hence I believe it will be safe to make a complete closure of the wound without drainage.

*Supplementary Note.*—Eight days later the pelvic viscera were removed under ether. The anesthesia was unsatisfactory and attended with a secretion of much mucus in the pharynx. However, the patient made a rather uneventful recovery and was well when last beard of.

**Consideration III.**—Do a thyroidectomy as the primary operation if the patient is highly toxic, illustrated by Case III. Mrs. G., fifty years of age, complains of nervousness, palpitation, and shortness of breath.

The history of present illness began two years ago, when patient was first told by a doctor that she had a goiter. She had staring eyes at that time and they have become more prominent during the last year. Nervousness has been getting worse. Palpitation for two years, but worse the past three weeks. Shortness of breath at times. Has lost about 40 pounds in three years. Seven months ago was in bed for three weeks with attack of nervousness, weakness, etc. Swelling of both lower legs at times, right worse than left. Has had gall-bladder

inhalation anesthesia required for another operation illustrated by Case II Mrs B thirty seven years of age enters the hospital with her complaint given as leukorrhœa choking and nervousness

The history of present illness began about six years ago with appearance of enlarged neck which continued to increase in size ever since No history of goiter in the family The source of drinking water six years ago was river water Patient is subject to choking sensations interference with breathing but no difficulty in swallowing There is a sense of pressure in the throat she has become very nervous knows of no etiologic factor in her case Menstrual flow very profuse there is also much leukorrhœa She has had spells of trembling palpitation of the heart also fast heart no vomiting diarrhea edemas or sweating There has been insomnia loss of strength much headache has had spells of hoarseness Has had pain in left side of abdomen

*Physical*—Her appearance is fair is 66 inches tall weighs 136 pounds Temperature is 99° F pulse 117 respiration 20 blood pressure 110/60 Heart and lungs are negative Urine amber in color specific gravity 1050 reaction acid Eyes reflexes teeth are negative lips red tongue very slightly swollen Thyroid greatly enlarged particularly left lobe which is size of fist right not palpable or visible but suspicious dulness under corresponding clavicle trachea deviates markedly to right no thrills or bruits heart not enlarged no abnormal sounds Abdominal examination shows wide costal angle skin all right moderate fat muscle tone all right no inhibition very tender low on both sides right kidney palpable left not rings all right perineal and vaginal conditions all right cervix high back medium sized fixed body large forward fixed tender fixed masses in both adnexæ has both external and internal hemorrhoids

*Diagnosis*—Salpingitis Toxic adenoma of thyroid

*Recommendation*—Thyroidectomy Later salpingectomy

*Discussion*—She has a mildly toxic adenoma of the thyroid and a double gonococcus pelvic abscess She is a woman in

gauze into the two lateral defects left by the removal of the lobes and leave the neck wide open except for one clip on the middle of the skin incision. In twenty-four hours the gauze pack will be removed; then in forty-eight hours the remainder of the skin wound will be closed if need be. It must be stated in passing that it is by no means always necessary.

*Supplementary Note.*—Four months later patient weighs 155 pounds, pulse 110, blood-pressure 135/75. Complains of pain in back between scapulæ of intermittent nature. Eight months after operation patient weighs 164 pounds, as compared with original weight of 137 pounds, pulse 104, blood-pressure 120/68. Heart is still slightly enlarged. Continues to have some indigestion, but has been free from severe gall-bladder attacks. Examination of the abdomen reveals muscle tone increased, especially high right; positive inhibition; tender McBurney.

It would have been obviously ridiculous in this instance to have operated upon this lady's gall-bladder during a hospital stay of any reasonable length. At the expiration of about eight months we consider her in sufficiently good condition to recommend this second major procedure.

**Consideration IV.**—Operate first upon a malignant lesion or one which constitutes an immediate menace to life, illustrated by Case IV. Mrs. T., fifty-two years of age, entered our service six months ago complaining of nervousness, palpitation, and bulging eyes.

The history of present illness began twelve years ago with enlargement of the thyroid gland, associated with nervousness, shortness of breath, palpitation, tachycardia, tremor, dysphagia, sweating, and marked exophthalmus. This condition became less severe after one year of medical treatment. This was followed by extreme weakness, loss of weight, marked edema of feet and legs. Condition has been better or worse during the past ten years, with no severe exacerbations, the exophthalmus having meanwhile cleared up considerably. In past year condition has again become more severe, especially

edema, and patient has been treated for kidney trouble. At the time the above history was taken we evidently failed wholly to get any data pointing to involvement of the gall bladder region. This may possibly have been our own fault, still, every surgeon of experience knows that gall stones may be found at operation in intelligent patients from whom no subsequent questioning, no matter how carefully conducted, will afford any data indicating past trouble in this region. Such instances are, I freely admit, rather rare but, on the other hand, 3 of them were encountered in our own clinic here within one week not many months past.

Six months ago at the time this history was taken the gall bladder was quiescent but the thyroid symptoms were so marked as to need immediate attention. She was doubly ligated and then sent home in rather satisfactory condition, being told to return in a few months for the removal of her thyroid. While in the hospital the second time awaiting thyroidectomy she had, a few days ago an acute attack of gall stone disease so severe as to necessitate operation.

*Physical (Made Six Months Ago)* —The patient presents a nervous appearance, is 64 inches tall, weighs 104 pounds. Temperature is 99° F, pulse 120, respiration 30, blood pressure 184/76, metabolic rate 55 plus. Heart arrhythmia, systolic murmur at apex. Lungs negative. Urine is yellow in color, specific gravity 1015, reaction acid, faint trace of albumin, few leukocytes. Pupils equal, react to light and distance, upper teeth artificial lower teeth filled with gold, but there is a marked pyorrhea. Systolic murmurs heard at apex, apex beat very abrupt and irregular, no thrills, marked cardiac arrhythmia, sounds very loud and pronounced. Entire gland is symmetrically enlarged right lobe about size of half lemon flattened, left not quite this size, thrills and bruits over right superior group at times, also over left group constantly, slight pulsation of entire gland, slight tremor.

In this instance I am chagrined to relate there is no record of an abdominal examination having been made. A complete physical examination should be afforded every goiter patient,

this being one of the few instances, I am sure, where it was neglected in our service, possibly on account of the patient's extreme nervousness and depletion at the time she was first seen. Attention might have been drawn by a thorough abdominal examination to the need of gall-bladder surgery which developed later.

*Diagnosis.*—Exophthalmic goiter.

*Recommendation.*—Ligations. Later thyroidectomy.

*Discussion.*—She is deeply jaundiced, hence it is obvious that a procedure, more or less a life-saving one, should take precedence over any other consideration. She is not improving, hence our hand is forced, being unwilling to wait for the spontaneous subsidence of symptoms associated with common duct obstruction; appreciating the significance of the secondary anemia and other deleterious consequences of continued deep jaundice, we now elect to treat the gall-bladder region surgically and postpone every consideration of the thyroid, especially since the patient's thyrotoxic condition is greatly improved. Her metabolic rate has decreased from 55 plus to 32 plus, while her blood-pressure is 150/80 instead of 184/76, as it was six months ago. Her general circulatory improvement has kept pace with the blood-pressure readings.

We shall now make a high right rectus incision of short length because we propose to inflict the minimum of surgical trauma. As will be noted, we are using no anesthesia other than infiltration of the abdominal wall with  $\frac{1}{2}$  per cent. novocain. The gall-bladder is thick, gray, and of medium size. It can, as you observe, be picked up, as long as it is not pulled upon, without the patient experiencing any pain. It is now stitched to the peritoneum and upon being opened several tiny black stones are seen. No attempt is made to completely evacuate its contents at this time since nature will attend to that need as soon as the patient is turned upon her face in bed. A rubber tube is thrust into the gall-bladder and sutured in place. Iodoform gauze is gently packed around it to protect the lips of the incision in the abdominal wall. The operation has taken but a few minutes. Every consideration has been given the fact that

this is a thyrotoxic patient. She is not a good subject for surgery they never are and unless handled with utmost discrimination are likely to furnish tragic surprises.

*Supplementary Note*—This patient continued to lose ground for four days and then died of exhaustion. This was in spite of repeated blood transfusions administration of intravenous glucose hypodermoclysis etc. No autopsy was permitted.

**Consideration V**—Correct the other lesion first when by so doing one removes a patent source of infection illustrated by Case V. Mrs. H. sixty-two years of age entered our clinic with belching and weakness as her chief complaints.

She is nervous does not sleep well coughs with frequent colds has shortness of breath and palpitation pain in left chest at times no vomiting no diarrhea no perspiration. Formerly had trouble with urination at which times it was very frequent but is not so now. She has been married twice has had 11 children of whom only 2 are living. Appetite has always varied. There has been a great deal of belching with gas formation constipation and hemorrhoids. As stated the history of present illness began with belching many years ago and grew much worse last summer with weak spells loss of weight much suffering from constipation. Must greatly limit her diet appetite varies still there are no attacks of pain. Much nausea but no vomiting.

*Physical*—The patient is emaciated 65 inches tall weighs 105 pounds. Temperature is 98° F pulse 80 respiration 20 blood pressure 165/60 hemoglobin 60 per cent. Systolic murmurs at apex of heart. Lungs negative. Urine is amber color specific gravity 1020 faint trace of acid. Medium costal angle rather wide pelvis many birthmarks little fat fair muscle tone rings normal *dull area high right* lipoma over the right rib margin this is the approximate size of a hen's egg there is no respiratory inhibition now no Meltzer right kidney very large in size comes to umbilicus when lying drops into pelvis when sitting. The right lobe of the thyroid is greatly enlarged displacing trachea far to left and is hard and nodular. There is a

high note under the right clavicle, heart is normal, marked tremor, no eye signs, no vascular disturbance, though she has palpitation of the heart at times

*Diagnosis*—Suspected gall bladder and appendix disease  
Toxic adenoma of the thyroid

*Recommendation*—Hospital rest & Ray study Thyroid ectomy

*Discussion*—After several days' hospital stay we have come to the conclusion that this lady's present symptoms are referable rather to an infected gall bladder than to her mildly toxic adenomatous thyroid hence we shall attempt to remove the source of infection and thereby the better prepare her for a subsequent operation for the relief of her goiter We now make a right rectus incision and find a long appendix with fairly large concretions in its extremity The appendix is removed as a matter of course The gall bladder is blue, is markedly distended and upon opening it we find many stones of small size consisting largely of bile pigment The deeper portion of the gall bladder and the cystic duct are surrounded by chronic fibrous adhesions The gall bladder is being removed, since we know from the studies of Graham and others that this is the only way to clear up the chronic reciprocal infection which persists, involving gall bladder liver, and pancreas unless the vicious circle be broken in this manner A soft drain is sutured to the stump of the common duct and complete closure of the abdominal wall will be made up to it, there being no occasion for opening the common duct which is not dilated or thickened if appearance is to be believed

*Supplementary Note*—In view of an exceptionally smooth convalescence a bilateral thyroid resection was done thirteen days later but apparently a longer interval should have elapsed, although she did fairly well so long as she was living her protected life in the hospital and went home in what we considered a fair condition She remained there only five days and then returned to the hospital completely exhausted and unable to take up the ordinary routine of life on account of too much surgery having been done within the limits of one hos



pital stay I am glad to say that she ultimately recovered and resumed her customary duties of housewife

**Consideration VI**—Economic considerations dictate that one operate first for the other lesion where such procedure necessitates a longer rest in bed than does a thyroidectomy, illustrated by Case VI Mrs K, twenty six years of age, entered our service with a complaint, in her own words of goiter and a low abdominal tumor

The history of present illness began when at fourteen years of age she noticed an enlargement of the neck. It has increased rapidly in size in the last month with increased symptoms. She is extremely nervous and takes cold easily. For the past four years has noticed tumor in abdomen. Had miscarriage, following this flowed profusely for eleven months. Three months after this noticed great enlargement of abdomen just before menstruation. At times abdomen goes down to almost normal size. Frequent urination. Shortness of breath when abdomen is distended. Her last menstrual period was on time. This function has been very irregular for two or three years clots being passed and considerable leukorrhoea annoying her at other times.

*Physical*—Patient presents a fair appearance, is 59½ inches tall, weighs 120 pounds. Temperature is 99.2° F, pulse 90, respiration 20, blood pressure 120/80. Heart and lungs are negative. The urine is straw color, specific gravity 1018, reaction acid shreds. Pupils equal medium, react to light, lips red, teeth show considerable dental work, tonsils enlarged. Thyroid very much enlarged right lobe being the greater of the two with dulness over right clavicle. Right lobe is apparently size of lemon fairly firm nodular, left lobe approximately half as large trachea slightly to left, no increased vascularity thrills or bruits. Rather full midabdomen, medium costal angle, dull mid and low abdomen over soft cyst like mass, no inhibition, kidneys negative, no splash. Perineum negative. Cervix very low, forward, long nodular mass behind body which is influenced by pressure on front of abdomen. Rectal examination confirms above. No hemorrhoids.

*Diagnosis*—Adenoma of the thyroid Fibroid of uterus

*Recommendation*—Hysterectomy (abdominal) Thyroidectomy

*Discussion*—There is no vital indication here from either lesion the patient's natural preference being for the pelvic work to take precedence This course will be followed in view of the fact that an abdominal convalescence in bed usually takes two weeks, whereas that following a *simple* thyroidectomy consumes not more than half this time In this manner they will be allowed to run concurrently and one week be saved thereby, she being in bed two weeks instead of three

We now make a low midline incision, and find that our diagnosis of uterine fibroid, somewhat hastily made is incorrect The patient was extremely sensitive when the vaginal examination was made, hence we erred in the character of the growth which is present It is now seen to consist of two enormous posthorn fallopian tube filled with clear fluid, the left together with the ovary on that side are matted into a chronic inflammatory mass low in the pelvis The right tube is free of the ovary, hence is being removed alone, leaving behind the fairly normal looking ovary, the woman being only twenty six years of age The left tubo ovarian inflammatory mass is now being removed in one block, the appendix shows a chronic fibrous change, hence is taken out to guard against further trouble A split tube is inserted in the depths of the pelvis and the wound closed up to it Spinal anesthesia has been used, as you observed, since we feared on account of the goiter to use one of the inhalation type

*Supplementary Note*—Eleven days later she consented to have her goiter removed, but I am convinced that a longer interval should have been allowed to elapse because the combination of these two surgical experiences came very near ending fatally No doubt she should have been sent home to recuperate in which event the thyroidectomy would have been much better borne After a somewhat lengthy convalescence she is now again in perfect health It was well in this instance that we did not attempt to live up to the economic program

and take out the goiter seven days after the original procedure I am convinced that it would have made no difference in the outcome had we reversed the order in which the operations were done. It was simply a matter of too much surgery in too short a time. In many instances the relief of an abdominal condition can be accomplished today and the goiter be removed one week hence with the utmost satisfaction in every way and with one week of hospital stay spared the patient.

*Collateral Observations*—It occurs to me to catalog at random a number of observations which have in my experience at least increased the difficulty of deciding which of two lesions was the more important in a given instance.

1 *More than one patient with her attention focused on a second disturbed area has absolutely denied all knowledge or symptoms of a goiter which to the examiner was apparent on most casual inspection and further than this even seemed in many instances to produce the more striking manifestations.*

2 I remember one lady quite well who presented herself with all of the classical history as well as all of the ordinary manifestations of an advanced toxic adenoma but who had a symptomless fibromyoma of the uterus as large as her head. An unusual mental attitude superinduced through misunderstanding of the case by her home physician impelled her to demand the removal of this uterine tumor she being under the belief that it was producing her weakness, emaciation, tachycardia, tremor, etc. she absolutely refusing to entertain our suggestions for thyroidectomy. From this case one may deduce that the patient's predilection can in certain instances be a determining factor in treatment.

3 Intercurrent complications of the first operation, no matter whether it be the thyroid procedure or the other one, sometimes proves to be the dominating influence in determining the length of the interval which shall elapse between the two therapeutic attempts. One of our patients contracted a postoperative pneumonia a few days following a hysterectomy, hence the thyroidectomy which had been planned to follow in one week was as a matter of course postponed for several months. The

patient being sent home meantime to convalesce and regain her strength to the fullest measure.

4. Patients tend quite regularly to belittle toxic symptoms when placed in comparison with those of an obstructive or those of a painful nature.

5. One must not defer too much to the judgment of a woman patient regarding the relative importance of a thyroid lesion and one originating in the pelvis. It is a woman's tendency to exaggerate, out of all proportion to their relative importance, symptoms which originate in the generative apparatus. I am sure that too much credence placed in a woman's judgment on this point, supplanting a decision determined by the operator's findings, can often lead to a faulty choice of future procedure.

6. In many instances where we are confronted by two lesions (one of them in the thyroid) demanding operation there will appear absolutely no definite data on which to base a choice of primary operative indication. In such instances we are perfectly free to consult the patient's whim, our own convenience, or the indications of an economic nature.

It will, I think, be concluded from the foregoing that the surgery of goiter cannot be separated from surgery in general or from general medicine for that matter. The surgeon who subjects the goiter patient to a complete routine examination will now and then inevitably find a second lesion demanding an operation as urgently as does the goiter. His thyroid experience must, it seems to me, be developed out of a general surgical training. As an example of this, consider how helpless the genito-urinary surgeon would find himself if he attempted to transplant the ureters for exstrophy of the bladder, provided he had never done intestinal work as a part of his abdominal surgical training. At an equally great disadvantage would be the half-trained gynecologist who in the course of a pelvic plastic operation found himself confronted with the necessity of removing the appendix and draining the gall-bladder. By the same token, the otologist who opens a thrombosed lateral sinus should surely be in a position to ligate the deep jugular vein without the advice or co-operation of a general surgeon.

Now finally as to a decision on which of two lesions to treat first this will from the foregoing I think be grasped as a highly individual problem in each case then as to what interval shall intervene between the two operations (it has varied from one week to four months in our hands) this is a matter which can be settled only by taking into consideration all of the circumstances which surround each patient. The chief of these will be: What is the patient's age? What is the gravity of her general condition? What is the type of goiter? In our clinic only one third of those presenting themselves with a double lesion have had the goiter removed as the primary operation the other two-thirds have seemed to demand immediate attention for the other lesion the thyroidectomy having been done at a second sitting.

## CLINIC OF DR H S CROSSEN

FROM THE GYNECOLOGICAL SERVICE OF THE WASHINGTON  
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### TYPES OF BLEEDING MYOMA

Case I—This patient, aged forty five, mother of 2 children, the youngest ten years old, comes on account of vaginal bleeding of nine months' duration. The bleeding has been continuous—some color all the time, with flooding at irregular intervals. Examination shows a firm, rounded mass the size of a large walnut at the vaginal vault, with a pedicle extending up into the partially dilated cervix. The mass is red and irregular in outline and consistency, and palpation of it causes bleeding. Tracing up the thick pedicle as far as possible without danger of stirring up severe bleeding, its attachment cannot be reached. There is no infiltration of the surrounding ring of cervix. The mass has the appearance and feel of a myoma rather than a malignant growth, though, of course, malignancy cannot be positively excluded. The corpus uteri is enlarged to about twice normal size and is irregular and fixed to the left side of the pelvis.

The patient's general condition is poor. She is markedly anemic from the continuous bleeding; there is a mitral insufficiency, and the heart's action is irregular. The urine and blood pressure are practically normal.

*Diagnosis*—Pediculated myoma, but malignancy not excluded. Continuous bleeding, with severe anemia. Mitral insufficiency with fair compensation, but possible myocarditis.

*Advice*—The immediate indication is to stop the bleeding, with the minimum disturbance to the patient, who is exsanguinated and has a bad heart. The patient will be sent to the hospital and preparation made so that any severe hemorrhage

that might start during the removal can be taken care of properly

*Subsequent Course*—The patient was taken to the hospital and after preparation to the operating room (presumably for examination in order to avoid excitement) In this examination the fingers were carried higher and the pedicle could be traced to its attachment which was to the right anterior portion of the cervical wall in the upper half The upper limit of the attachment could not be reached Following the examination a strong pedicle forceps was slipped about the pedicle under guidance of the examining fingers and clamped down without discomfort to the patient Under touch the pedicle was then cut through distal to the forceps and the mass removed The forceps were left in place and surrounded by a light packing of gauze so that the metal could nowhere touch the vaginal wall The forceps were removed the next day and the gauze packing against the cervix the succeeding day

There still remained unanswered the questions as to whether or not the mass was malignant and also whether or not its removal would stop the bleeding Microscopic examination showed the tumor to be a myoma of the cervix without complicating malignancy There remained however the possibility of malignancy higher in the uterus It was thought best not to disturb the patient with a diagnostic curettage The urgent indication was to stop the bleeding so that she could be built up to a condition that would permit of the safe carrying out of any further procedure found necessary The definite identification of the cervical growth as a myoma made it probable that the irregular enlargement of the corpus was due to similar nodules so I felt safe in awaiting developments

There was no more bleeding and the patient improved rapidly under a tonic regime including iron for the anemia and ergotin to diminish uterine congestion

*Case II*—This patient forty two years of age and unmarried gives a history of profuse and prolonged menstruation for several months past During the last two months there has been

several flooding spells, the last of which was so severe that packing was necessary. Her physician could feel a small projectin mass at the cervix.

The patient is emaciated and markedly anemic, with conjunctivæ very pale and a yellowish tinge to the skin. Heart examination shows mitral stenosis with a murmur and precordial thrill, edema of the ankles, and crepitant rales at the base of each lung. The pulse is 92 and of fair quality. Blood pressure, systolic 130 and diastolic 80. Urine 1012, clear, no albumin, no sugar.

*Examination*—The vaginal opening admits one finger only. A firm rounded mass the size of the end of a finger can be felt inside the cervical canal. The external os is partially dilated over it. The lower margin of the mass can be traced to the left wall of the cervical cavity. On account of the danger of starting another severe hemorrhage no further intracervical exploration is advisable at this time. The corpus uteri is forward, but cannot be outlined.

*Diagnosis*—Sessile mass growing from the left wall of the cervical cavity, with size and extent of attachment undetermined, may be myomatous or malignant. Severe anemia from recurring hemorrhages, apparently due to the cervical growth. Mitral stenosis with definite circulatory disturbances in extremities and lungs.

*Advice*—The growth being sessile and of undetermined extent considerable cutting may be necessary to remove it. Being in a virgin with a small vaginal opening general anesthesia may be necessary for the required operative manipulations. The patient is in no condition for operation or anesthesia. She is to be sent to the hospital for further study and building up, vaginal packing to be employed immediately if bleeding should appear. The blood examination shows only 2,000,000 reds and a hemoglobin estimate of 20 per cent, though this is probably somewhat low.

*Subsequent Course*—After being under observation and treatment for six days with some general improvement, a bloody discharge appeared. It was evident that something must be



done in spite of the risk involved. With the patient well under morphin hyoscin analgesia the vaginal opening was dilated and then the cervix. The sessile mass was attached over nearly the whole length of the cervical canal extending from just within the external os to the internal os, and projecting for  $\frac{1}{2}$  inch out into the dilated cervical canal. To reach the upper portion of the growth it was necessary to divide the cervical wall anteriorly for  $\frac{1}{2}$  inch. The growth was then grasped with a tenaculum forceps and excised at the base. The bleeding was controlled and the tissues approximated by chromic catgut sutures. Bimanual examination showed the corpus uteri enlarged about twice, and irregular, with two distinct nodules. The internal os, which was small was dilated and the uterus curetted. The cavity was  $3\frac{1}{2}$  deep and quite irregular. There was a considerable quantity of curettings that looked rather suspicious of malignancy. A carbolic application was made to the interior of the uterus as always after curettage when there is any suspicion of malignancy. The cervical incision was closed with chromic catgut. No general or local anesthetic was necessary, the morphin hyoscin analgesia proving sufficient.

Microscopic examination showed the tumor to be a myoma of the cervix. There was no evidence of malignancy in the cervix nor in the curettings. The patient recuperated slowly at first and then rapidly.

The tendency of rare cases to come in groups may be recalled in this connection. Although myoma of the cervix uteri is rather rare comprising only about 5 per cent. of all myoma cases, a physician from a country village brought to me 3 cases at one time. The case just reported was the most seriously sick patient of the 3 the 2 other patients being in fair general health as the bleeding had been less free. The second patient aged forty-five, had a sessile myoma the size of a walnut growing from the right cervical wall and dilating the canal. It was excised as in the reported case after satisfactory exposure by division of the cervical wall. The third patient, aged fifty, had a firm tumor the size of a lemon, blocking the upper end of the vagina and preventing palpation of structures above. When prepared for

operation, I was able to place a clamp on the broad pedicle extending to the cervical wall and to divide the pedicle below the clamp, which was left on. In both these cases microscopic examination showed the tumor to be a myoma of the cervix without complicating malignancy in the tumor or in the endometrial curettings.

These 2 cases as well as the first, were handled without general anesthesia morphin hyoscin analgesia sufficing notwithstanding the considerable traction and cutting necessary.

Hyoscin morphin analgesia has proved so satisfactory for curettage, specimen excision, intra uterine radium treatments, and excision of cervical growths that I seldom find it necessary to add anesthesia in any form. The patient is given  $\frac{1}{4}$  gr morphin and hyoscin, 1 ampule (B & W—about 1/132 gr), one hour and forty five minutes before the time of operation. Forty five minutes later, which is one hour before operation, the patient is given a second dose of hyoscin (1 ampule), but no morphin. In a small patient the dose of morphin is reduced to  $\frac{1}{6}$  gr.

In cases of pediculated myoma arising from the corpus the pedicle is usually longer and more slender, and hence more easily clamped than in those arising from the cervix. A dangerous complication to be watched for, however, is partial inversion of the uterus. This may be brought about as the tumor is forced down out of the cervix by uterine contractions or by traction during removal. In the case of the cervical myoma as large as a lemon mentioned above, partial inversion of the uterus was suspected as the cervical attachments of the pedicle could not be felt at first, and the corpus uteri felt short and broad, as though partially inverted. But by the deeper examination later I could determine that the pedicle arose from the cervical wall and that the irregularity of the corpus uteri was due to other nodules there.

In a myoma lying in the cervical canal and apparently a cervical myoma the pedicle may be quite difficult to reach, and one must be prepared to deal with such a problem. A case in point was one in which a physician brought his sister to me on account of persistent uterine bleeding. Examination revealed

a small firm myoma nodule lying in the middle of the cervical canal the lower part of which was open sufficiently to admit the tip of the finger. It seemed a simple matter to dilate the lower part of the cervix and remove the small round mass. The patient was a virgin and anesthesia was necessary to satisfactorily dilate the vaginal opening and the cervix. The lower part of the cervix would not dilate sufficiently to permit catching hold of the mass so the anterior wall of the cervix was divided about half way up. Examination then showed that the rounded hard surface palpated in the cervix was only the lower end of a larger rounded movable mass lying in the uterine cavity. In order to get hold of the mass it was necessary to incise the vaginal wall in front of the cervix raise the bladder off the uterus and continue the division of the cervix up past the internal os. This gave plenty of room to introduce the finger into the endometrial cavity and to determine that the firm myoma was the size of a walnut and had a pedicle. The pedicle was crushed with a clamp and the tumor removed. The clamp was then loosened and as there was practically no bleeding it was removed. The uterine wound was then sutured with chromic catgut and the vaginal wound was likewise closed. The patient recovered without special disturbance.

Case III—This patient aged forty eight is still menstruating fairly regularly. For the last three years the flow has been increasing in duration and now it lasts ten to fourteen days. Otherwise the patient feels well and has continued at her occupation as a school teacher. Examination shows the corpus uteri forward and somewhat enlarged. Deep pelvic palpation is not possible on account of the small vaginal opening and the abdominal resistance so the extent of the uterine enlargement cannot be determined. One or two small nodules can be felt. The cervix is normal.

*Diagnosis*—Bleeding from within the uterus due probably to myoma but possibly to malignancy.

*Advice*—Curetage (therapeutic and diagnostic) and pelvic palpation under anesthesia.

*Subsequent Course*—Examination under anesthesia showed the corpus uteri forward and enlarged to size of small fist, with distinct myoma nodules in the anterior portion and a large extension into the left side of the pelvis. The uterine cavity was 5 inches deep and was distorted. There was a moderate amount of curettings. Not much bleeding after the carbolic application.

The microscopic examination of the curettings showed no malignancy. The patient was given ergotin and nux vomica for local astringent effect and also an iron tonic. The plan was to await developments to see if the bleeding would cease, as sometimes happens from a curettage. If the bleeding reappeared, then radium or  $x$  ray would be used, as malignancy had been excluded.

The extra bleeding disappeared but the menstrual flow was still rather free. After three periods of moderately free flow, I advised  $x$  ray treatment. For some reason the patient could not take the  $x$  ray treatment just then and it was postponed for a time. The next flow was less, so she concluded to wait awhile. Subsequently, the menstruation became decidedly less and the amenorrhea of the menopause appeared and she has had no further trouble.

Curettage will occasionally take care of excess bleeding from a myomatous uterus. It is particularly useful in younger women where radical operations and radium treatment and  $x$  ray treatment are to be avoided on account of their destruction of function. When a young woman comes with bleeding from a small or medium sized myomatous uterus, I usually give a course of internal medication consisting of uterine astringents or endocrine preparations, or both. If this medication takes care of the bleeding it is repeated from time to time as needed. If the bleeding persists in spite of internal medication, then curettage is carried out, including a carbolic application to the uterine interior. The curettings are examined microscopically to ascertain what change, if any, is taking place in the endometrium. After curettage the internal medication is continued as needed to regulate the menstrual flow. It is only when serious bleeding persists, in spite of these measures that the next choice (oper

ative removal) is undertaken and this is undertaken reluctantly because of the possibility of having to sacrifice the uterine function. Operation is of course undertaken with the hope that conditions will be suitable for myomectomy and preservation of the uterus but the possibility of conditions being quite otherwise must be kept in mind when considering operation.

**Case IV**—This patient aged thirty five and married eight years had her first pregnancy last year. For a year preceding the pregnancy she menstruated every two to three weeks. She was delivered at term three months ago and has been bleeding every day since. She has been confined to bed with weakness and pelvic discomfort and has been able to walk for only the last three weeks. Her general condition is very good considering the persistent blood loss. The heart lungs pulse blood pressure and urine are normal.

*Examination* shows the uterus in marked retrodisplacement and enlarged and irregular and choking the posterior part of the pelvis. The uterus and surrounding tissue are tender but there is no evidence of active inflammation. The uterus cannot be raised. An attempt was made to allay the tenderness by hot douches and to bring the uterus forward by the knee chest posture and bimanual manipulation but without result.

*Ad ice*—It is evident that more radical measures are necessary to secure any progress toward restoration of the patient's health. With the conditions present it is apparent that internal medication would be a waste of time and curettage would only introduce additional danger into an already complicated situation. Neither radium nor x ray therapy are advisable on account of the resulting destruction of the ovarian function along with that of the uterus. If sacrifice of the uterine function is necessary it were better carried out by operative removal which would still preserve ovarian function. Again there is the possibility of finding conditions favorable for myomectomy though this is not a probability. Operation is clearly indicated.

*Subsequent Course*—Examination through the abdominal incision showed the uterus far back and enlarged by many

myoma nodules The uterus was brought up and carefully examined to determine the possibility of myomectomy The myomata were so numerous and deeply placed and widely scattered that myomectomy was clearly not practicable, and the myomatous uterus was removed by supravaginal hysterectomy The right adnexa presented chronic inflammatory changes and were removed The left adnexa were normal and were preserved The appendix was 5 inches long and lying over in the pelvis, and was removed The abdominal incision was closed without drainage The pelvic floor was markedly relaxed inside, but outside the opening was narrowed and there was hypersensitive scar tissue that caused the patient much discomfort I excised the hypersensitive scar tissue and widened the opening on the skin surface, and then made the usual inside deep repair of the pelvic floor

The patient convalesced satisfactorily and has had no special trouble since

**Case V**—This young unmarried woman, aged thirty, comes complaining of menorrhagia, which has been present for the last three years and is increasing in severity She has stood the blood loss very well and is in fair general condition, but has evidently been disturbed both physically and mentally by the persistent bleeding Also there have been pains in the appendical area and she has been told that she has chronic appendicitis

*Examination* shows the uterus enlarged to the size of a fist by a myoma, apparently one large nodule deep in the wall No adnexal disturbance Some tenderness in the appendix area Heart and lungs normal Blood pressure, systolic 125 and diastolic 82 Urine normal Has some chronic indigestion and gets weak at the menstrual time from blood loss Patient is contemplating marriage in a few months and wishes the bleeding stopped and the pelvic lesion taken care of promptly

*Advice*—Abdominal operation for removal of the uterine tumor and the appendix The preservation of the uterus is, of course, a very important consideration The deep situation of the myoma indicates that a myomectomy, if found practicable,

*Subsequent Course*—The patient's condition continued good until the next day when the temperature rose to 103° F. The second postoperative day the temperature went to 105° F and the pulse rose accordingly reaching a rate of 140 but with fair volume. There was no evidence of peritonitis at that time but there was an increasing discharge from the uterus which showed *Streptococcus hemolyticus* in vast numbers. We were evidently dealing with an infection of extreme virulence starting in the uterus. A drainage tube was introduced through the cervix to provide free drainage of the infected cavity and among other things the patient was given antistreptococcus serum. The next morning the temperature had dropped to 100.5° F but in the afternoon it rose to 105.5° F. The patient's condition went steadily from bad to worse in spite of the numerous measures employed (including blood transfusion peritoneal drainage serums and mercurochrome intravenously) and she died of peritonitis on the sixth postoperative day.

Postmortem examination with bacteriologic data showed clearly that the virulent hemolytic streptococcus infection started in the uterine cavity and progressed through the wound in the uterine wall to the peritoneal cavity and then throughout the peritoneal cavity. All blood cultures taken during life were sterile. At autopsy cultures taken from the heart blood the spleen and the kidney were all sterile.

*Conclusions*—Is there any way in which this catastrophe could have been prevented? Hysterectomy instead of myomectomy would probably have saved the life of this highly useful woman. The virulent bacteria were evidently propagating in the blood serum which because of the persistent bleeding formed a continuous test tube culture medium from outside the body to within the uterine cavity. It is possible of course that sufficient bacteria would have remained after a hysterectomy to have caused a fatal infection but it is not probable for the vagina can be fairly well disinfected. The disconcerting thing about this case and its outcome is that there was nothing in the clinical symptoms or in the operative findings to indicate the presence of virulent bacteria in the uterus. As far as could

be seen at the time this myomectomy would prove successful, as most clean myomectomies do. Though very extensive, this myomectomy was no more so than the 2 cases just previously described, each of which recovered without any disturbance.

What bearing has this experience on the question of extensive myomectomy which opens the uterine cavity? It does not contraindicate deep myomectomy, for extensive experience has shown that that operation is reasonably safe and is strongly indicated in young women anxious to preserve the reproductive function. Comparing this fatal case with the 2 cases that recovered promptly without disturbance, there are found certain differences, the consideration of which may prove helpful in deciding between myomectomy and hysterectomy in a border line case. In the 2 successful cases there had been no invasion or disturbance of the uterine cavity by parturition or otherwise. The bleeding was intermittent (simply an increased menstrual flow), with periods between free from bloody discharge or other abnormality. At operation the tumor showed no degeneration. The color indicated a perfectly healthy growing myoma with good circulation. In each case there was extensive opening of the uterine cavity. Though opening the uterine cavity undoubtedly adds an element of danger, the extent of the opening seems of no importance provided the damaged uterus can be satisfactorily repaired.

In the fatal case the patient had passed through parturition five and a half months previously. The delivery and puerperium were normal. There was no indication of infection at any time. The myoma gave no trouble during pregnancy or labor or in the puerperium, except a persistent slight bleeding. The serious bleeding did not appear till four months later. A few days before operation the bleeding became so severe that vaginal packing was necessary to control it. Summarizing the special elements in this case we find as follows:

(a) There was a persistent bloody discharge constituting a continuous culture medium upward to the uterine cavity.

(b) There was vaginal packing in the last few days. This packing was carried out under ordinary antiseptic precautions,



but experience teaches that notwithstanding aseptic and antiseptic precautions complete sterilization of the vagina is problematic. With a warm culture medium extending into the uterus vaginal packing undoubtedly increases the chance of there being infective bacteria in the uterus at operation a few days later.

(c) The tumor was degenerating. The degeneration was clearly a circulatory necrobiosis without bacterial invasion as shown by the preoperative symptoms, the operative findings and the later bacteriologic investigation of the tumor. I do not feel that this tumor degeneration had any influence on the result except in so far as there may have been some circulatory deficiency in the tissues around thus diminishing tissue resistance. Care was taken to excise well out into apparently healthy tissue.

My conclusions in regard to borderline cases of myomectomy opening into the uterine cavity are as follows:

1. Hysterectomy rather than deep myomectomy is advisable in cases of recent hemorrhage requiring vaginal packing. In a case where myomectomy is much desired operation should be postponed (if the hemorrhage can be sufficiently controlled by palliative measures) for a month or more beyond all vaginal disturbance to give time for autosterilization of the genital tract.

2. In a case of persistent bleeding requiring deep myomectomy preoperative bacteriologic investigation of the vaginal contents is advisable. Any infective bacteria in the uterus are likely to show in the vaginal or cervical contents. It is preferable to avoid invasion of the endometrial cavity in this investigation as that might start a fresh purulent infection in the operative field.

3. Degenerative changes found in the tumor during operation are an indication for hysterectomy rather than deep myomectomy. This is of course a relative indication depending somewhat on the type and extent of the degeneration. Infection or malignancy or conditions suspicious of either make removal of the uterus imperative. Circulatory changes in the growth if at all extensive make hysterectomy advisable because of the

likelihood of diminished resistance in the adjacent tissues. Small areas of circulatory degeneration well removed from the margin of the growth would hardly constitute a contraindication to myomectomy in a patient anxious for preservation of the uterus and with everything else favorable.

Case VII—This patient, aged forty six and unmarried, was first seen two and a half years ago on account of a prolonged menstrual flow. The menstruation had always been regular both as to time and amount until the preceding month, when the flow lasted six days instead of the usual four. The next menstruation was two weeks late (beginning menopause), but when the flow started it persisted for sixteen days and was still going on when she came to me. There was no pain, and the patient was in good general condition, but much worried at this sudden appearance of persistent bleeding. Internal medication for a few days had no effect, so the patient submitted to a local examination. The vaginal opening was so small and resistant that vaginal examination was not possible, so a recto abdominal examination was made. No pelvic mass or special tenderness was found. As the bloody discharge was still present and malignancy could not be excluded, I advised curettage and pelvic examination under anesthesia. This was carried out and revealed a mucous polyp projecting from the cervix. The corpus uteri was slightly enlarged and irregular, but no nodule could be felt. The slight widening and irregularity at the fundus could be easily due to a minor defect in development. The adnexal regions were normal. It appeared probable that the persistent bloody discharge was due to the cervical polyp. The polyp was twisted off and then the uterus was curetted. The cavity was 3 inches deep without definite irregularity, and there was only a small amount of curettings. Microscopic examination showed no malignancy in either the polyp or the curettings. As usual in these cases, ergotin and extract of *nux vomica* were given in moderate doses in capsules for several weeks following the curettage.

There was no more abnormal bleeding for two years, the

menstruation continuing fairly regular. The patient then returned stating that there had been some bloody discharge off and on for the past month. Examination revealed a long mucous polyp projecting from the cervix. This was twisted off and an astringent application made to the base and a tampon applied. Microscopic examination showed a simple mucous polyp with no evidence of malignancy. There was no further bleeding for a month when the menstrual flow appeared and lasted for ten days. Examination then revealed a small polyp which had evidently come down from higher in the cervix. This was twisted off and the cervical canal explored with forceps to see if there were any more higher. No others were found and an astringent intracervical application was made. The patient was advised that if there was any further bleeding another curettage would be necessary.

A slight bloody discharge continued to recur off and on so the second curettage was carried out a few days ago. The palpation under anesthesia shows the uterus to be somewhat larger than formerly and that the cavity is now  $3\frac{1}{2}$  inches deep. The curettings are moderate in amount and show some endometrial hyperplasia but no evidence of malignancy.

*Diagnosis*—Small myoma deep in the uterine wall. The definite enlargement in the outline of the corpus uteri, the increase in the length of the cavity and the persistent bleeding tendency make it clear that there is a growth of some kind in the uterus. Microscopic examination of curettings excludes malignancy of the endometrium and also hyperplasia of an extent to cause the findings.

*Ad ice*—The problem is to stop the bleeding without undue risk to the patient or unnecessary interference with her activity. Malignancy has been excluded so there is no serious objection to waiting to see the effect of the curettage along with special medication. The patient will be given mammary substance 5 grain doses in capsule twice daily continuously for a month or two and then at intervals as indicated by a tendency to flow.

*Subsequent Course*—The patient got along very well with

an occasional moderate flow, for eight months. Then irregular bleeding at short intervals appeared and it was evident that more radical treatment would be necessary to control the bleeding from the deep myoma nodule. There had been no appreciable increase in the uterine enlargement. The conditions were favorable for radium treatment of the myoma, which was advised and carried out. A dose of 1800 milligram hours was given from within the endometrial cavity, without any untoward reaction or other disturbance. This dose can be depended on, in the case of a small myomatous uterus to stop bleeding and menstruation. Microscopic examination of the curettings removed at the radium application confirmed the previous microscopic diagnoses of no malignancy.

Supposed mucous polypi, or any other abnormal tissue removed from the cervix, should always be submitted to microscopic examination to determine definitely whether or not malignancy is present. This point is illustrated by another case presenting repeated polyp formation. The patient came with some bleeding from a large, soft polyp in the cervix. She gave a history of repeated formation of a polyp in the cervix and its removal. They were supposed to be "mucous polypi" and were not sent for laboratory examination. When the patient came under my care another "mucous polyp" had formed. This was removed and sent in the routine way to the laboratory. The report that came back stated "sarcoma." After careful confirmation of the diagnosis the enlarged uterus, which had been bleeding some was removed. When opened it showed an extensive endometrial sarcoma. From this growth a small polypoid mass had projected into the cervix from time to time and had been removed as a "mucous polyp."

Case VIII—This patient, aged fifty one, had regular menstruation up to one and a half years ago, since which time there has been a show of blood nearly every day. She had one severe hemorrhage three years ago but none since. Examination shows the corpus uteri forward, enlarged to one and a half times and somewhat irregular. No nodule can be felt. The

cervix is notched but otherwise normal. There is no mass or special tenderness in the adnexal regions. The condition causing the bleeding and the moderate enlargement of the corpus uteri may be carcinoma or myoma. The age of the patient and the continuous slight flow make it look suspicious of carcinoma.

*Advice*—Diagnostic curettage. If carcinoma is found then abdominal hysterectomy with adnexal removal (to catch the upper broad ligament lymphatics) is advisable. If no malignancy is present then radium treatment for myoma will suffice.

*Subsequent Course*—Diagnostic curettage was carried out and microscopic examination showed no malignancy. The situation was then explained to the patient and radium treatment advised and carried out and there has been no further trouble. Both the diagnostic curettage and the later radium treatment were carried out under hyoscin morphin analgesia no general anesthesia being needed.

This is a typical case of that large class of bleeding myoma cases in which radium application is the preferable form of treatment. The characteristics are a patient past the child bearing period presenting a small to medium sized myomatous uterus with bleeding as the principal symptom and malignancy excluded by curettage. In cases where it seems fairly clear from the history and examination that the growth is a myoma I usually combine the diagnostic curettage and the radium application in one sitting. If the instrumental investigation of the uterine cavity confirms the probability of myoma without malignant complication the radium is immediately introduced and left in for a myoma dose (1500 to 2000 mgh).

*Case IX*—This patient aged forty four has had uterine bleeding which has been almost continuous for three months and has at times been quite free. In addition there has been much pain off and on through the lower abdomen. Examination shows the cervix lacerated and with much chronic infiltration and irritation. The everted surfaces bleed easily on touch but they are everywhere soft and show no evidence of malignancy. The corpus uteri is enlarged two times and irregular probably from

myoma There is thickening and tenderness in the left adnexal region The pelvic floor is fair

*Diagnosis*—Bleeding myoma of corpus uteri with malignancy not excluded Chronic salpingo oophoritis (left) Extensive laceration and chronic infiltration of the cervix The patient is moderately anemic, but otherwise in fair general health All the organs seem to function satisfactorily The urine is normal The systolic blood pressure is 130 and the diastolic 80

*Advice*—Radium treatment for myoma, with diagnostic curettage, would be indicated in this case were it not for two things The first is the lacerated, everted, infiltrated, "pre cancerous" cervix, and the second is the painful, chronic salpingo oophoritis, fixing the corpus uteri to the left side of the pelvis The first makes hysterectomy (complete) advisable and the second indicates abdominal rather than vaginal hysterectomy

*Subsequent Course*—The operation revealed a uterus enlarged to the size of a small fist by a myoma deep in the wall The left adnexa showed chronic inflammation and fixation Complete hysterectomy with removal of left adnexa was carried out with no special difficulty After removal, the myomatous uterus was opened It showed no evidence of malignancy, so the right adnexa were preserved The patient convalesced without particular disturbance

Case X—This patient, aged fifty three, has been bleeding irregularly for the last year, with a profuse and prolonged flow at times She missed the flow entirely for three months, then bled for two weeks, then stopped for two weeks, and then started again ten days ago and is still flowing Patient has had no pain Examination shows a rough suspicious cervix and an enlarged corpus uteri The extent of the enlargement, however, cannot be determined on account of resistance Curettage and pelvic palpation under anesthesia shows the corpus uteri retro displaced (movable) and enlarged two and a half times There is some irregularity, but no distinct nodule There is no evidence of malignancy in the curettings or in the specimen excised

from the cervix. The lacerated cervix shows extensive chronic infiltration and irritation—a typical precancerous cervix.

*Advice*—Hysterectomy complete vaginal. The size of this myomatous uterus and the age of the patient would make radium the preferable form of treatment were it not for the dangerous cervix which needs to be removed and the retrodisplacement of the heavy uterus. On account of the last two conditions hysterectomy is advisable. As local conditions are favorable for vaginal hysterectomy that method is to be employed because it is less dangerous than abdominal hysterectomy.

*Subsequent Course*—The operation was carried out as planned and the patient convalesced without particular incident.

**Case XI**—This patient aged thirty nine was curetted for uterine bleeding ten years ago. Following this the menstruation was regular for a considerable period but became too free again seven years ago. She was then curetted again and was given x ray treatments. There was decided improvement for a year or two and then irregular bleeding started and continued till eight months ago when an intra uterine radium treatment was given. Then there was no flow for six months. The bleeding began again three weeks ago and has continued to the present time. The patient came under my care a week ago and was given mammary substance freely to try to check the flow but without effect. The history indicated that malignancy had been excluded at each curetting by microscopic examination of the tissue removed and also at the radium application seven months ago. At the curetting seven years ago it was found she had a myoma.

*Examination* shows the corpus uteri enlarged two and a half times and ball shaped with a distinct projection forward evidently a myoma nodule. The myomatous uterus is firm and not tender. There is no adnexal mass or tenderness. The cervix is notched but there is no special infiltration or chronic irritation. The pelvic floor is relaxed. The bleeding at present is free and persistent and the patient insists that some kind of effective treatment must be employed promptly.

*Advice*—Vaginal hysterectomy The failure of x ray and radium treatment indicates that the tumor does not respond well to radiation Hysterectomy is the only certain method of removing this resistant and troublesome growth The vaginal route is chosen because there is no adnexal or other complication contraindicating it, and it will be less of a strain to the very stout patient than would abdominal hysterectomy

*Subsequent Course*—The patient went through the operation in good condition The myomatous corpus proved to be too large to be brought out of the vagina in the usual way, so it was bisected and delivered half at a time The adnexa were normal and were preserved The patient convalesced without complication in the operative field She developed a severe cystitis and later some pyelitis which however yielded promptly to treatment

**Case XII**—This patient, aged forty two, has been having very profuse menstrual flow off and on for five or six years, and especially during the last two years The flow starts at the regular time every twenty eight days, but continues over a long period The duration of the flow varies, but lately it has been almost continuous The patient's color is yellowish pale and she is evidently markedly anemic The hemoglobin estimate shows only 30 per cent The patient suffers with severe cramps at each menstruation and also has much backache and pelvic pressure between

*Examination* shows the corpus uteri in retrodisplacement and enlarged to the size of a small fist and irregular The enlargement is probably due to myomata, though malignancy is not positively excluded The corpus uteri is somewhat movable, but cannot be brought forward The attempt to raise the uterus causes pain

*Diagnosis*—Uterine myoma causing persistent bleeding and serious anemia Malignancy cannot be positively excluded The situation is further complicated by marked retrodisplacement of the myomatous uterus

*Advice*—The local conditions are such that operation would



be the preferable treatment, but the patient's general condition absolutely contraindicates operation. The urgent indication is to stop the bleeding, so the patient may be rescued from the condition of extreme anemia. But in trying to stop the bleeding nothing must be done that would encroach on the patient's small store of remaining strength. Just at present the flow is slight but flooding is due again in a few days at her menstrual time. After considering the various features of the situation, I feel that the best plan is to give a blood transfusion and then, under the improvement thus secured, make a diagnostic curettage and introduce radium, employing packing afterward as necessary to temporarily control the bleeding until the hemostatic radium effect can be secured. The curettage and radium application are to be made under hyoscin morphin analgesia without general anesthesia.

*Treatment*—The blood transfusion produced decided improvement, and preparations were then made for the next step in treatment. Here a difficulty was encountered in that the patient had an idiosyncrasy to morphin. She stated it always excited instead of quieting her. Her vitality was still so low that it was important to avoid general anesthesia. The effective morphin hyoscin analgesia could not be used, and we were dealing with a nervous apprehensive individual not suitable for local anesthesia. I decided to try codein and hyoscin as a sedative and then supplement with novocain injections about the cervix if necessary. The cervix dilated easily. The uterine cavity was 4 inches deep and irregular, apparently from the encroachment of a large lateral mass. Curetting brought away only a small amount of tissue, with moderate bleeding. A strong carbolic application was made to the cavity, followed by an alcohol application. The radium was then introduced and a firm vaginal packing applied. The codein and hyoscin acted well as a sedative and no local anesthesia was necessary. A radium dose of 1200 milligram hours was given the dose being kept small because of the danger of a large dose causing extensive sloughing in a submucous myoma.

*Subsequent Course*—When the radium was removed there

was moderate bleeding and the vagina was immediately repacked. No gauze was placed in the uterine cavity or even in the cervix, because of the probability of exciting uterine contraction. The history of cramps at the beginning of each bleeding spell and the fact that the preliminary administration of ergot increased rather than diminished the flow, indicated that the large submucous myoma, though still sessile, was projecting into the cavity sufficiently to excite uterine contractions. When this condition was recognized, oxytocics were avoided, and sedatives were given to quiet the uterine muscle. Two days later the second packing was removed, and as there was still some bleeding another vaginal packing was introduced. When this third packing was removed after two days, bleeding had ceased and no further packing was needed.

Microscopic examination of the curettings showed no malignancy. The patient improved steadily under a tonic régime, including special diet, iron, and sedatives. Later uterine astringents were added in doses to tone up the uterus, but not excite contractions. Her strength gradually returned and in two weeks she was able to leave the hospital. The improvement continued, though the patient was nervous and apprehensive and impatient to be well and return to her work. Since the death of her husband, eight years previously, she had been an energetic business woman, successfully managing an advertising business which brought in a fair income for her support and the education of her son. As is usual after radium treatment, there was considerable discharge. At times the discharge was bloody which greatly discouraged the patient, in spite of the fact that I explained to her that such discharge was to be expected. There was also considerable pelvic discomfort from the active process going on in the heavy retrodisplaced uterus. After the patient had been home some time her physician asked me to see her and encourage her as far as possible. I did so and then reported to him as follows:

"Dear Doctor S. I saw Mrs. W. yesterday afternoon. She was quite discouraged and depressed because she still had pelvic discomfort and some bloody discharge when up and about,

and also because of the uncertainty as to when she could return to work. The latter was a large factor in her worry as it is important for her to make definite arrangements in regard to her work. I went over the whole situation with her so now she understands the facts takes a more cheerful view and is ready to adjust herself to the necessities as they arise. The following are some of the points in the situation.

1 The submucous myoma in a retrodisplaced uterus was as I explained at first very unfavorable for any treatment except operative removal. But as the condition precluded operation radium offered the best chance of checking hemorrhage and getting her in condition for operation if such should eventually prove necessary.

2 The effect of the radium treatment and the tonic regime has been marked in checking blood loss and in making new blood. To have accomplished so much in six weeks in the face of the difficulties presented means excellent progress. On account of the submucous character of the large myoma I feared a return of the hemorrhage at the menstrual time and explained to her at the hospital that we might have to use packing at that time. But she has passed the first menstrual time without serious hemorrhage.

3 The leukorrheal discharge and some bloody discharge is to be expected as an active disintegration process is going on within the uterus. Owing to the conditions present the discharge will be more in amount and last longer than in radium treatment in an ordinary case. The important thing is to prevent harmful blood loss while this disintegration process is going on. For that purpose packing may be necessary at times. So far it has not been necessary as lying down checked all but a slight show. The pelvic discomfort also is due to the congestion accompanying the active process going on in the uterus. This is aggravated by the displacement.

4 Examination shows that the tumor has already diminished somewhat in size so much so that it has become movable and can be pushed up out of the pelvis. On this account the knee-chest posture is to be taken now regularly to diminish

pressure symptoms and hasten absorption by improving the pelvic circulation

"5 As to further treatment, rest is one of the most important factors, and this will be necessary for several weeks. I advised her to arrange her business for at least two months' rest. For the first few weeks she should be in bed most of the time. This is important to diminish the blood in the discharge and to allow the disintegration process to go on undisturbed. It may be necessary later to supplement the radium treatment with  $\alpha$  ray, but I would like to avoid it, if feasible on account of the gastro intestinal upset it may cause.

"6 Owing to the radium treatment and your blood making course the patient is getting now toward a condition where operation may be safely carried out, if it becomes necessary. However the local improvement so far leads me to hope that the radium alone or supplemented by  $\alpha$  ray, may be sufficient."

There was slow but steady improvement in the patient's general condition and in the local symptoms, and after some weeks she was able to get out and about, gradually increasing her outside activity. She went out in the country for a time I had been able, about two months after the radium treatment, to bring the retrodisplaced myomatous uterus forward and introduce a pessary which held it fairly well in place. Five months after the radium treatment there was some show of blood on two occasions and the patient's physician sent her to my office. Examination showed a rather free flow. The corpus uteri was back, though not as far back as at first. The retro displacement was not doing well under pessary treatment. Evidently it would continue to give pelvic discomfort besides aggravating the tendency to bleed at times. The patient's general condition was satisfactory for operation and removal of the tumor and uterus could now be safely carried out. However the patient was averse to operation, preferring to continue with the less radical measures. The uterus was brought well forward, the pessary replaced, and supplementary  $\alpha$  ray treatment advised. The  $\alpha$  ray treatment checked the bleeding tendency, and by use of the pessary and the knee-chest posture

and frequent oversight the uterus was kept forward fairly well. The patient had taken up her work which she carried on with increasing satisfaction as her general condition improved. There was no further show of blood for a year and a half, when the patient recently complained of slight bleeding. Examination showed an irritated spot on the vaginal wall near the cervix, evidently due to the pessary. It bled easily. The myomatous uterus had diminished about one fourth in size and was staying moderately well forward under pessary support and the knee chest posture. The patient was in good general health and good spirits, was able to take care of her work with satisfaction and pleasure and had adjusted herself to the slight inconvenience of the knee chest exercise and vaginal douches. An astringent application was made to the irritated area, douches ordered more regularly and the pessary left out. At the last visit a short time later there had been no further show of blood. The patient complained of considerable backache and dragging. This troubled her to some extent while the pessary was in, but much more since it was out. The local irritation was much less, and the pessary can soon be replaced.

Reviewing the case we see that by the measures employed this patient was rescued from a condition of grave anemia and danger and was restored to health and her usual energetic activity. The myomatous uterus was changed from an actively bleeding organ that threatened her life, to a non bleeding structure. The only remaining troublesome factor is the retro displacement of the heavy myomatous uterus, which could have been taken care of long ago by operation if the patient had not preferred to continue with palliative measures. It is probable that operative removal of the backward inclined tumor bearing uterus will eventually be necessary on account of recurring irritation from pessary support.

Case XIII — This patient, aged forty five, comes on account of a large uterine myoma extending half way to the umbilicus, accompanied with bleeding and anemia. There is much tenderness about the growth, probably due to some form of degenera-

tion in one or more of the large nodules. The cervix presents old laceration with eversion and much chronic infiltration and irritation. Menorrhagia and metrorrhagia have continued in spite of palliative measures, and are steadily reducing the patient's strength.

Locally, the indications are urgent for operative removal of the tumor and uterus, but the patient's general condition absolutely contraindicates operation. She has cardiac enlargement, with dilatation and tachycardia, and a question of myocarditis. There is serious anemia, the hemoglobin estimates running 42 to 45 per cent. In addition, there is arteriosclerosis and hypertension. The systolic blood pressure is 186 and the diastolic 110. The urine is normal except for low specific gravity (1008). The kidney functional test shows 55 per cent elimination in two hours and non protein nitrogen 334. The lungs are normal. The heart shows hypertrophy and dilatation with a blowing systolic murmur at the apex transmitted to the sternum. The cardiac impulse is heaving with a suggestion of presystolic thrill. The pulse runs about 116. It shows hypertension, but is fairly regular in force and rhythm. The electrocardiogram shows tachycardia (117) of sinus type with left ventricular preponderance. The patient has just spent a month in a distant famous sanatorium where efforts were made to improve her condition but without appreciable effect.

*Diagnosis*—Hypertension. Arteriosclerosis (general). Cardiac hypertrophy and dilatation with a question of myocarditis. Chronic tonsillitis. Serious anemia, due to recurring bleeding from a large myoma of the uterus with malignancy not excluded.

*Advice*—Operative removal of the tumor, which is strongly indicated by the local condition, is impossible for the present. Curettage is urgent to check the persistent blood loss and to determine whether or not there is a complicating endometrial carcinoma, but the heart condition is so threatening that even the slight upset from curettage under local anesthesia or under hyoscin and morphin is not to be risked. The tumor is not suitable for intra uterine radium treatment for it is very large and presents large subperitoneal nodules. Even the ordinary

gastro intestinal upset from x ray treatment might prove too much for the patient

Something must be done, and I have finally concluded to try deep x ray therapy tentatively, hoping thereby to check the bleeding sufficiently so that the patient may be built up to a point where the needed operation may be carried out

*Subsequent Course*—The x ray treatment was begun with small doses and increased very gradually to avoid the usual gastro-intestinal disturbance. The patient was turned over to the medical service for general treatment and continued observation. She remained in the hospital six days, during which time she received the deep x ray therapy and a general medical work up with directions accordingly for the anemia and hypertension and cardiac trouble. The general plan of treatment was rest in bed, medium nephritic diet, digitalis, and iron. When the patient returned one month later for the second series of x ray treatments her condition showed marked improvement. Since the first x ray series the menstruation had been practically normal consisting of a rather free flow for three days and a slight flow for three days more. There had been no other bleeding and there was less pelvic pain and tenderness. The general condition also was definitely improved. The patient felt better though she still complained of occipital headaches, dry throat and attacks of palpitation. The pulse was 120, full and regular. The systolic blood pressure was 185 and the diastolic 105. The patient's general condition was fair, with moderately good color of the lips and nail beds. The hemoglobin had risen to 80 per cent. The heart was now about normal in size but the impulse was heaving. There was a soft systolic murmur over the apex not well transmitted and also a louder, coarser murmur over the sternum. At long intervals there was an arrhythmia apparently an early extrasystole with uneven pauses for a few beats. The patient menstruated while in the hospital and the flow was rather profuse.

The patient returned to the hospital three weeks later for the third series of x ray treatments. Dr Dock's report at that time showed the blood practically normal. The pulse was regular

and ranged from 74 to 96 when taken by the nurse, but jumped to 150 with marked subjective palpitation on the visit of the physician. There seemed to be a marked neurotic element in the pulse variations. The hypertension had increased, the systolic blood pressure being 215 and the diastolic 120. The electrocardiogram showed left ventricular preponderance, as to be expected with the hypertension, but otherwise was normal. The urine was normal, with a specific gravity of 1010. The phtalein kidney test showed 73 per cent elimination in two hours, the non protein nitrogen was normal, and the concentration diuresis test showed no impairment of kidney function. Dr. Dock felt that the marked and increasing hypertension was probably due to climacteric influence in association with the irritating pelvic lesion and that it would probably subside gradually after removal of the pelvic tumor. He considered the patient then in fair general condition for operation, and we advised the same. However, the patient was averse to operation. She had improved so much under palliative measures that she wished to continue, hoping for still greater improvement.

The x ray treatments were continued at three week intervals. Dr. Dock advised that the hypertension be controlled entirely by diet, tepid bathing, and quiet life, without resort to drugs. There was to be no medication unless new symptoms arose. The patient was given detailed instructions. No attention was to be paid to the blood pressure, which the patient was to be encouraged to forget as far as possible. It was hoped that the x ray treatments would stop all bloody flow, but this result was not attained. The menstruation continued in about normal amount. The blood picture remained good, showing 4 000 000 to 5 000 000 reds, 6000 to 8000 whites, and 85 to 90 per cent hemoglobin. The pulse continued practically normal when quiet to very rapid when excited. The blood pressure continued high, systolic 200 and diastolic 120. When the patient came for her sixth series of x ray treatments four months after her first visit to the hospital, the general improvement continued, though the blood pressure remained around 200 and the pulse became very rapid on the least excitement. Locally, however, there had been



no improvement but rather otherwise. The tumor had remained the same size but there was increased tenderness which had persisted since the last trip and x ray treatment. Following the last trip there had been some bloody discharge lasting several days. There had been considerable bladder irritability since the abdominal tenderness appeared. There was probably some degenerative process going on in the tumor and its removal by operation was strongly indicated. The situation was carefully explained to the patient and operation advised. She decided against operation then but proposed the following compromise course. If during the next month there was no decided improvement she was to return for operation. If during this period of waiting bleeding or other disturbance should appear she was to return at once.

At the end of the month the patient returned with the report that the pelvic discomfort had continued about the same and that she had just had a rather severe bleeding spell. Local examination showed increased tenderness of the tumor. The general condition was fair. The blood showed 4 680 000 reds 6900 whites and 78 per cent hemoglobin. The urine was 1010 acid no albumin no sugar no casts. The kidney functional test showed 62 per cent elimination. The pulse was full and tense and varied from 80 to 120 but was regular at each rate. There was apparently a psychic factor in the change of rate. The heart sounds were strong with a loud systolic murmur transmitted over the base and the aortic second sound clear and strong. The systolic blood pressure was 204 and the diastolic 120.

Operation was advised at once before the onset of another bleeding spell which might weaken the patient materially. The operation was carried out. The irregular myomatous mass filled the pelvis and lower abdomen with the omentum lightly adherent to it. One nodule the size of an orange had grown into the right broad ligament and caused considerable difficulty in reaching the vessels of that side. The tumors and uterus were removed completely including the cervix. The left ovary and tube showed chronic inflammation and were removed along with the uterus. Inspection of the opened uterus and of the

incised tumors showed circulatory degenerative changes in some of the large myoma nodules but no evidence of malignancy hence the normal right adnexa were preserved. Ether anesthesia was employed with hyoscine and morphin as a preanesthetic sedative, 6 ounces of ether being used. The pulse became weak for a time, following crowding of the anesthesia at the beginning of the operation. Otherwise the pulse was good throughout.

The patient stood the operation and the postoperative strain very well. The pulse ran 106 to 120 for the first three days and then 90 to 110 for the next two weeks. The temperature varied from 99° to 100.5° F for seven days and then from normal to 99° and 100° F. The kidneys handled the additional work satisfactorily. There was a good amount of urine, no albumin or casts and no evidence of acidosis. When the patient was about ready to leave the hospital the smooth convalescence was interrupted by an attack of cystitis and pyelitis, the temperature going to 102.5° F. This yielded promptly to regular bladder irrigation and mercurochrome instillations, with one instillation in the left kidney pelvis. The temperature dropped to normal in four days and remained there, and the patient went home a few days later. The patient was on a high nephritic diet, omitting salt and meat. She objected to this diet which seemed to cause gas and fulness after meals, so she was allowed regular diet minus salt. When she left the hospital the blood pressure was perceptibly lower, the systolic being 170 and the diastolic 104.

Case XIV — This patient aged thirty eight comes on account of blood loss from prolonged and excessive menstrual flow. Formerly, the duration of menstruation was three days but for more than a year past it has been lasting seven and eight days and is very free for half that time. The patient feels weak and exhausted and has much pain before and during the flow. She must lie down during menstruation, but between periods has managed to keep at her work as a sister in a Catholic order. Examination shows no polyp in the cervix, the bleeding evi-

dently coming from higher up. The corpus uteri is somewhat enlarged and irregular, but cannot be outlined on account of the difficulties of examination. The patient's general condition is good except for the pronounced anemia.

*Diagnosis* —Secondary anemia due to bleeding from uterine carcinoma or myoma.

*Advice* —Diagnostic curettage and pelvic examination under anesthesia.

The examination under anesthesia showed the corpus uteri elongated and enlarged at the fundus about two times apparently by a deep seated growth. The cervix was easily dilated. The uterine cavity measured  $3\frac{1}{2}$  inches. The curettings were small in amount. There was moderate bleeding which checked very well following the carbolic acid application, no packing being needed. Microscopic examination of the curettings showed no malignancy. The bleeding was evidently due to a small myoma and should yield readily to radium or x ray treatment. In order to avoid another anesthesia and local disturbance x ray treatment was selected.

*Subsequent Course* —The deep x ray therapy did not produce the hoped for result though it was pushed to the point of severe intestinal reaction, the patient vomiting for two or three hours and having prolonged nausea afterward. There was free flowing at irregular intervals and in spite of hemostatic medication, this showed a tendency to increase rather than diminish during the seven weeks of waiting. The failure to respond at all to radiation treatment indicated that the myoma was largely submucous or was undergoing some degenerative change. The patient began to show loss of strength from the recurrent bleeding and it was clearly necessary to employ promptly some form of effective treatment.

Operative removal of the tumor and uterus by abdominal hysterectomy was advised. At operation the corpus uteri was found enlarged to about one and a half times normal size with the tumor very deeply placed. After removal the uterus was opened and showed a submucous myoma the size of a walnut situated at the fundus and projecting into the cavity. It was

not pediculated, but almost so. There was no evidence of malignancy or of degenerative change. The convalescence was smooth, but the return of strength was very gradual in spite of the blood making regime, owing to the pronounced anemia of long duration.

Four weeks after operation there was some vaginal bleeding, which alarmed the patient very much. Examination showed the pelvic interior to be in excellent condition. The vaginal vault was healed, with the exception of a small granulating area at the site of the drain. Complete hysterectomy with a small rubber dam drain at the vaginal vault was the type of operation employed. An explanation to the patient, that there would be some discharge and possibly a show of blood at times while the drainage tract was healing, relieved her of further anxiety.



## CLINIC OF DR. ERNEST SACHS

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### VARIOUS TYPES OF PATHOLOGIC LESIONS OF THE CENTRAL NERVOUS SYSTEM THAT ARE READILY AMENABLE TO SURGICAL MEASURES

TODAY I propose to present to you 4 cases that illustrate four different types of tumors that occur in the central nervous system that are benign in character and readily relieved by surgical measures

Case I.—This first man, aged sixty-one (Figs. 420 and 421), walked into my office complaining of a mass on his head which had been increasing in size rapidly. He also dragged his left foot. He had no headache or disturbance in vision and felt well but for this dragging of the foot. Upon physical examination the positive findings were as follows: A mass on the head which lay in the median line, pulsated freely, and had a longitudinal incision over the center of the mass. There were extremely large veins running up from both frontal regions toward the mass. The left foot was completely paralyzed; the ankle-jerk was normal, as were all other reflexes in both arms and legs. The eye-grounds were perfectly normal. The history stated that this mass had developed in twelve weeks and that one month before he had struck his head on the corner of a closet. One month after the mass appeared he began to drag his foot. The x-ray showed a perforation of the skull, but the edges of the bone were not moth-eaten as in malignancy. The incision had been made some weeks before by some one who believed this to be a sebaceous cyst. He soon saw his mistake and sewed up the wound. The presence of this simple skin wound, however,

complicated the surgical procedure. We have here a classical case of dural endothelioma or, as some more recently call it, meningioma. This term is used with the idea of emphasizing its origin.

Under local anesthesia two bone flaps were reflected, using the old skin incision as the junction of the two flaps, this was the only way of dealing with the problem, as a single flap with base on one side would have been in danger of becoming gangrenous as the old incision would have endangered the blood supply of the end of the flap. The bone immediately around the



Fig 420—Case 1



Fig 421—Case 1

perforation in the skull was left attached to the tumor, as it usually is invaded by tumor cells. After reflecting the bone flaps to either side the dura over each hemisphere was incised, and it was then found that the tumor was growing on either side of the longitudinal sinus and had invaded it and was pressing on the two leg centers. In order to do a radical removal the veins running into the sinus on either side were clipped with silver clips and the longitudinal sinus for a distance of  $1\frac{1}{2}$  inches was resected (Fig 422). Microscopic examination (Fig 423) showed a typical endothelioma. The procedure was

long and tedious, so that at the end the patient was rather severely shocked. The loss of blood had not been very great. The patient was transfused with 1500 c.c. of blood by the syringe-cannula method.

The next morning the patient's temperature, pulse, and blood-pressure were normal. His general condition was good, but his left arm and leg and right leg were totally paralyzed. This was felt to be due to the interference with cortical circulation. The clinical picture was identical with the gunshot wounds



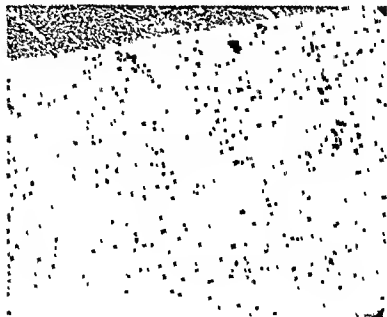
Fig 422—Case 1 A is the longitudinal sinus filled with tumor. The masses on either side are endothelioma which were pressing on the two leg centers. The upper mass, the larger one, lay over the right cortex.

of the longitudinal sinus that were so graphically described during the war by Gordon Holmes, the characteristic feature being that the legs are more involved than the arms because the leg center lies nearer the sinus and is, therefore, more markedly affected. This is in sharp contrast to the picture seen in an ordinary internal capsular lesion where the arm is more affected than the leg.

This patient did not begin to recover the use of his extremities until the fourteenth day after operation. First he began to



move his fingers, then there was a delay of twenty two days before he began to move his elbow and shoulder. Within three days after this he moved his leg, first the thigh, then the leg, and finally the foot. Progress was slow, as the patient was not very co operative and his age no doubt also was a serious factor. He was discharged from the hospital walking with two sticks five months after the operation, though he began to walk with crutches at the end of three months.



presents numerous interesting features. In the first place it illustrates admirably how extensive an operation can be undertaken under local anesthesia. Another most instructive feature is the postoperative paralysis and method of recovery. Evidently the paralysis was due to vascular changes in the cortex, and once the collateral circulation was re-established the recovery was rapid, the recovery was in accordance with the location of the motor centers those nearest the sinus, and therefore getting the poorest circulation, recovering last of

all Whether the blow on the head started the tumor is uncertain but this history is frequently obtained in cases of endo theloma

Case II—This patient aged seventeen (Fig 424), walked into the dispensary in 1915 complaining of headache and vomiting and drawing of his head backward The symptoms had started suddenly six weeks before Patient screamed with pain and vomited daily a number of times Two years before he had been struck in the head with a baseball and was unconscious



Fig 424—Case II

for five minutes His mother stated the boy had acted peculiarly for some months The right hand had been getting weaker for the past two weeks

The positive findings were

- 1 Head held to the right shoulder
- 2 Double choked disc with tremendously tortuous vessels
- 3 Lateral nystgmus to right and left
- 4 Inco ordination and adiadokokinesis of the left hand

x Ray showed nothing positive The diagnosis of a right cerebellar tumor was made

The usual bilateral cerebellar exposure was performed. The folia of the right cerebellar hemisphere were broader than normal. A glomatous cyst containing about 2 c c of fluid was opened and a solid tumor 5 c c long shown in Fig 424 was removed. The boy made an uneventful recovery and left the hospital three weeks after the operation. He has been perfectly well since.

This is the most favorable type of glioma we have to deal with, the cyst with a small solid growing mass in the wall. If the solid nubbin in the wall is removed the patient makes a perfect recovery.

Case III -- Patient a butcher fifty years old admitted to Barnes Hospital June 23 1921. He had been complaining of headache dizziness and falling for two and a half years. He had had pains in his abdomen and subsequently in the back and head. He complained a great deal of dizziness had projectile vomiting (sudden vomiting as he called it) and would stagger and fall when walking also some ringing in both ears. One year after these symptoms began they subsided but the year before his admission they returned with greater intensity. His walking became so bad that he only got around with help. He fell sometimes to the right and sometimes to the left side but most frequently forward. He had lost 15 pounds in two months had grown weak and complained of poor eyesight. He had had several unconscious attacks lasting from two to ten minutes. Just prior to his admission he had some difficulty in swallowing.

The important points on physical examination were

- 1 Normal eye grounds
- 2 Head held toward the right shoulder (cerebellar attitude)
- 3 Marked Romberg sign
- 4 One eye kept closed most of the time as if to exclude a double image
- 5 Hypalgesia of both cornea
- 6 Inability to stand on either foot with eyes closed
- 7 No nystagmus

8 Bárány tests (Dr Lyman) suggested a lesion involving the posterior longitudinal bundle.

The opinion before operation was that this patient had a lesion in his posterior fossa near the median line because of his falling to either side and forward. The bilaterality of his symptoms pointed to the median line. The falling forward is partic-



Fig 425—Case III

ularly characteristic of a vermis lesion near the posterior inferior surface. On account of his occupation and the absence of a choked disc I believed we might be dealing here with a cysticercus of the fourth ventricle, which develops so slowly that it produces few if any pressure symptoms.

The patient was operated on June 28, 1921, under local

anesthesia ( $\frac{1}{2}$  per cent novocain with 3 drops of adrenalin to the ounce) A median line incision was used which could readily

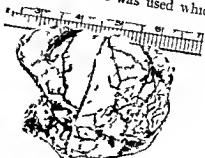


Fig 426—Case III



Fig 427—Case III

be changed into the usual cross bow incision if necessary Upon opening the bone the dura was found under increased pressure,



Fig 428 —Case III



Fig. 429.—Case III.

and a ventricle puncture was done through the right occipital pole. On opening the dura a white pearly mass, about the size of a cherry, was seen filling the fourth ventricle (Fig. 425). The mass was well encapsulated and by careful dissection was slowly elevated from the floor of the fourth ventricle. It was attached to the lower surface of the vermis and was finally removed *in toto*. The upper end of the tumor had plugged the aqueduct of Sylvius, which was greatly dilated. As soon as the tumor was removed a free escape of cerebrospinal fluid



Fig. 430—Case III

occurred from the dilated aqueduct of Sylvius. The dura was left open and a layer suture was done. The patient stood the procedure very well and his only complaint during the operation was of abdominal pain as the tumor was lifted out of the fourth ventricle undoubtedly vagus stimulation. The tumor measured  $4\frac{1}{2} \times 3 \times 3\frac{1}{2}$  cm (Fig. 426). Figure 427 shows the appearance of the wound when the tumor was removed. Figure 428 is a microphotograph of the tumor with the characteristics of a benign papilloma probably growing from the choroid

plexus. Figures 429 and 430 show the patient's appearance after operation and his median line scar. From this it is evident that the patient still had a slight cerebellar attitude to his head, but otherwise all his symptoms disappeared and now, four years after operation he is still perfectly well and, I have no doubt will remain so.

This case is of unusual interest, as at the time it was the first successful removal of a fourth ventricle papilloma recorded in the literature. Since then Dr Cushing has recorded a similar case.

Case IV represents a type of lesion that occurs both in the spinal canal and cranial cavity. We have had 2 well advanced cranial cases and 2 spinal cases, and several spinal cases that I believe are the early stages of the same kind of process. In the literature they are usually spoken of as angiomas, but I believe it would be better to speak of them as telangiectases, as they are really not true tumors. Some years ago (in 1915) I suggested this term for these conditions in a paper before the American Neurological Association. One of these spinal cases I shall report here and the other similar types of these lesions are well illustrated in Figs 431-435 inclusive.

Patient, aged thirty one was a seamstress. Her past history was essentially negative. Her present illness was as follows. Ten years ago the patient noticed while walking with a crowd one evening that she had some difficulty in keeping up with them. It seemed to her as though her leg were heavy and unwieldy. A few days later she had occasion to jump from a veranda, and in doing so she apparently tore a tendon on the inside of her right knee. This accident she describes as a sudden snap with a resulting swelling and some disability in that knee for a week or so. A short time later she noticed that the right great toe and the sole of the foot at the base of the right toe seemed numb, and about the same time or slightly later she became conscious of a peculiar sensation along the outside of her right leg apparently along the course of the sciatic nerve. She next noticed that while she was lying in bed the right leg tended to drop



from any upright position in which she might place it to the side because of gravity. These things occurred within a month of her first symptom. Later when walking she found that it was necessary to support herself by putting her hands on the walls for fear of falling. About this time she began to notice that her left leg was troubling her in the same way. Following this

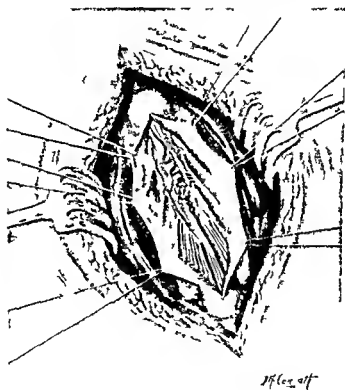


Fig. 431

she had a sensation in the right upper leg which she describes as that of ripples one following the other in rapid succession. About this time or just after she noted that when she rose from a sitting position to walk about the room it was impossible to walk quietly but that she always stamped in a rather awkward loud manner and by this time she constantly had to sup-

port herself on the wall. Following this she used crutches. This was about four months from the onset. After this she first noticed that there were sensations about her right leg similar to bands. Shortly after, the same happened on the left

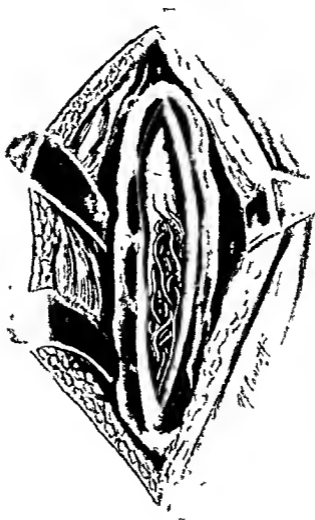


Fig 432

leg, but at no time was it as marked as on the right. She fell several times while walking and her legs became gradually more numb, but at no time did she entirely lose sensation. She noticed about this time that there was some incontinence of feces and she had a distinct urgency of urination. Then some-

what later there was some retention. She described her bladder symptoms as sudden stopping then commencing and then sudden stopping. At this time she had a distinct line of changed sensation which she said was the same as it was on admission to the hospital namely tenth or eleventh dorsal skin segment. Later she had some return of motor and sensory function.

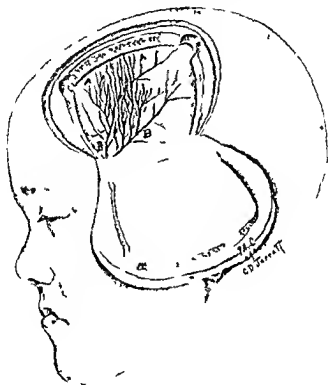


Fig 433 —Dural type

She was married in 1916 and left her husband in January, 1917, and in March 1917 she had a five months' miscarriage. She stated that her sexual functions were normal.

In the latter part of 1917 her legs began to get worse, that is, they became stiff, and she noted for the first time movements which were not under voluntary control. According to her

description they were steppage movements as described by Babinski in "Reactions de Defense" On admission these notes were made in the history "Her legs draw up in a flexed position and it is with some difficulty that they are straightened. At the same time her feet are extended at the ankles. At times she has a sensation in her right knee and anterior part of right

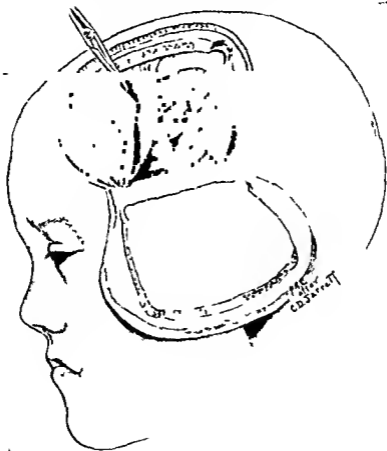


Fig 434—Dural type

hip region which is very unpleasant, and while not exactly a pain, is a disagreeable sensation, which she seems unable to describe. At present she has a diminution of sensation below a certain level which is higher on the right than on the left. There is a loss of voluntary motor function in the lower extremities. She knows when both bladder and rectum are about

to function but she has an incomplete control over each. At present there is no local pain over the spine but she gives a history of pain a number of years ago which she apparently localizes about the ninth or tenth dorsal.

The positive findings in the physical examination were as follows: *Abdomen* Left upper abdominal reflex active. *Others*

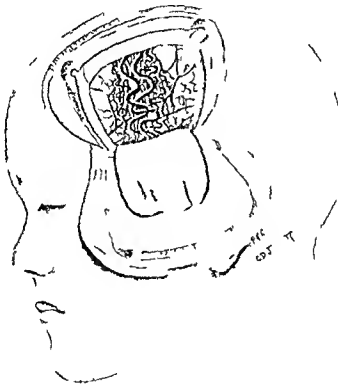


Fig. 435—Cort. cal type

not obtained. Sensory loss from the tenth dorsal skin segment down. Marked Beevor's sign. *Lower extremities* Spastic fairly well developed rigid patient unable to walk. Diminished sensation over both legs. Reflexes hyperactive left greater than right. Bilateral ankle clonus left more marked than right. Bilateral Babinski and Oppenheim. Atopognosis marked.

in lower extremities Patient unable to recognize position of toes Marked limitation in motion of hips, knees, and ankles (spastic) ”

My discussion of the case prior to operation was as follows: “Typical picture of a focal spinal lesion which has developed

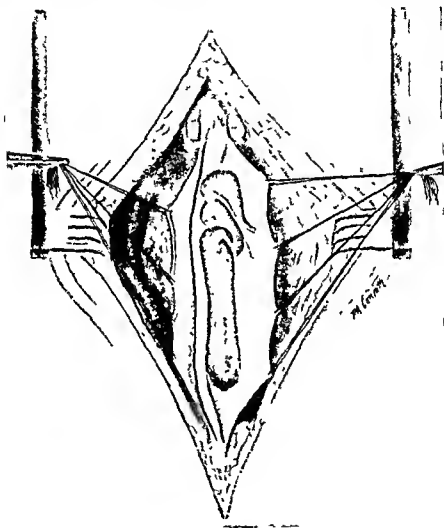


Fig 436

slowly, with bladder and rectal incontinence, and tremendous spasticity. The level of the change of sensation corresponds on the right side to a line opposite the umbilicus, which is the junction of the ninth and tenth dorsal spinal segments, on the left side it is a segment lower. Beever's sign is present. Spinal punc-

ture shows a xanthochromatic fluid and a fairly positive Quackenstedt. This case is clearly a typical picture of a spinal cord tumor. The absence of much pain and the absence of localized pain over the spinous processes does not preclude a tumor. To have a laminectomy of the sixth, seventh and eighth spinous processes.

At operation six spinous processes—the seventh to the twelfth dorsal vertebræ—had to be removed. A huge vein shown in Fig. 436 lay to the right side of the cord and had compressed it to such an extent that it was about one third the size of a normal cord. The vein was completely removed, but the prognosis as to recovery of the cord was not good. A follow up on this case has confirmed this original impression. Any spinal cord that has been compressed for a long time—ten years in this case—is liable to be permanently injured, so that even if the lesion is removed, complete recovery is not possible. It is a very curious fact that soft tumors, as in this case, sometimes produce more damage than solid tumors. Why this should be has never been satisfactorily explained. Before operation a vascular lesion was not suspected, but in reviewing the case I find that this patient had a symptom that occurs quite characteristically in these lesions, namely, a marked period of remission. This was so striking in a patient whose lesion is illustrated in Fig. 432 that she had been considered a malingerer and treated quite brutally while at home in Russia. When the lesion is due to numerous vessels, as in Figs. 432 and 435, the technical difficulties of removing them become often insurmountable. These vessels are so thin walled that merely touching them ruptures them. They cannot be ligated. In the case illustrated in Fig. 432 two attempts at removal were made and both times the patient had to be transfused and the operation discontinued.  $x$  Ray is said to have some effect in these cases, but I have never seen it help.

Figure 431 illustrates what I believe to be an early stage of the same process. Mere ligation of the large artery relieved the symptoms, which were those of a focal spinal lesion—exaggerated reflexes and a definite sensory level.

These telangiectases are rare conditions. In 132 laminectomies we have only encountered it twice.

## CLINIC OF DR A O FISHER

FROM THE DEPARTMENT OF SURGERY, WASHINGTON UNIVERSITY  
AND BARNES HOSPITAL

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### THE SURGICAL TREATMENT OF ILEOCECAL TUBERCULOSIS

WE have for consideration today 2 patients who illustrate very well the two generally accepted types of cecal tuberculosis. I am showing them because they have been under observation for a year or more. Both were operated on, and although in each case the condition was far advanced and the surgical risk great, I think you will agree that it was justified. Without surgical intervention they were doomed, whereas now they are making steady progress with a fair chance of recovery.

The cecum is more frequently involved in tuberculous infection than any other portion of the gastro intestinal tract. Reports indicate that from 50 to 80 per cent of people who die of pulmonary tuberculosis show intestinal involvement and of this number it is generally agreed that the cecum is attacked in at least 85 per cent of the cases (Brown and Sampson). Two general types of cecal tuberculosis are recognized, one, the so called hyperplastic type or tuberculoma which may or may not be associated with tuberculosis elsewhere, and the ulcerative type, which is practically always associated with pulmonary disease. Interest has chiefly centered about the former type, the tuberculoma because it has frequently demanded surgical intervention. Operation was at first instituted not so much with the idea of curing the disease, but as an emergency measure to relieve obstruction, or, in those cases where a palpable mass was present, on the assumption that the condition was malignant. Operation on diagnosed cases of intestinal



ture shows a xanthochromatic fluid and a fairly positive Quackenstedt. This case is clearly a typical picture of a spinal cord tumor. The absence of much pain and the absence of localized pain over the spinous processes does not preclude a tumor. To have a laminectomy of the sixth, seventh and eighth spinous processes.

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These telangiectases are rare conditions; in 132 laminectomies we have only encountered it twice.

for advice. He had no symptoms referable to the heart or lungs.

*Examination* at that time showed a fairly well-nourished and well-developed colored man. He had enlarged cervical

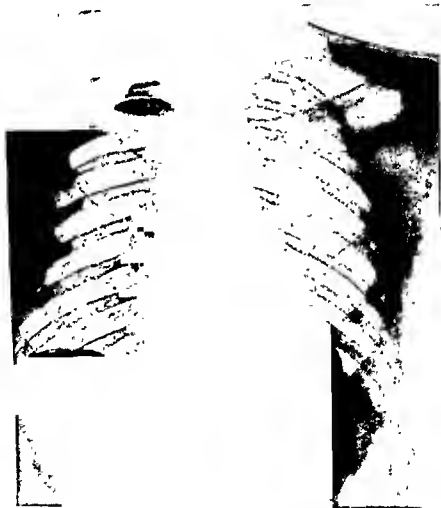


Fig 437 —Case I. x-Ray of chest. Shows no definite evidence of pulmonary disease.

glands on the right side with several healed scars, the result of previous gland suppuration. Throat and mouth negative. Examination of the chest was essentially negative. x-Ray of the chest (Dr. Sherwood Moore) showed a slight general haze, obscuring the left base and costal angle, moderate amount of

tuberculosis where there have been no urgent symptoms has not been generally advocated but the favorable results following the removal of these lesions has shown that surgery probably offers the greatest help in treating an otherwise hopeless condition. A recent contribution by F C Herrick (Annals of Surgery April 1925) on tuberculoma of the cecum is an interesting study particularly from the standpoint of pathology and differential diagnosis. We feel that many of these cases go unrecognized through the early stages when operation offers the greatest help. Unquestionably many so called tuberculous appendices have been removed leaving behind a diseased cecum and radical though it may seem resection in such cases should be done. All our efforts should be directed toward early recognition and obviously the x ray is the most helpful means we have at present. We advocate an x ray examination of the gastro-intestinal tract in all cases in which the cecum is under suspicion.

**Case I**—Our first patient a colored man was admitted to the Barnes Hospital from the Outpatient Department on April 14 1924. He was unmarried twenty four years old and a butcher by occupation. He complained of constipation and pain in the lower right abdomen. His family history was entirely negative both parents 5 brothers and 5 sisters were living and apparently well. He had measles and chickenpox at eighteen smallpox at twenty and mumps at twenty one. In 1918 he had influenza and in 1921 pneumonia from which he made an uneventful recovery. He denied venereal infection. His present illness began five months before admission with indigestion and pain which was localized from the beginning in the lower right abdomen. The pain was dull in character more or less constant with occasional exacerbations unrelated to the taking of food. Constipation was present and had gradually become more severe. Two months later he consulted a doctor who made a diagnosis of appendicitis and put him on a restricted diet. He showed little improvement and three weeks before admission he came to the dispensary

lymphocytes, with no other notable findings. The urine was negative, kidney function test negative, Wassermann negative. Tubercular fixation test negative. Up to this point the positive findings were a lymphadenitis, probably tuberculous—a questionable pleurisy at the left base, and a right-sided abdominal tumor with some obstructive symptoms. Owing to his occupation, actinomycosis was considered, but the presence of a mov-



Fig 439—Case I Photograph of specimen removed at operation Shows terminal ileum, cecum, and appendix, with tumor at ileocecal junction

able tumor, his age, general appearance, and clinical course all suggested tuberculosis rather than malignancy. A gastrointestinal x-ray examination (Dr. J. W. Larimore) is summarized in this report:

1. Stomach corresponds to habitus
2. Case examined with clinical findings of a palpable mass in the right lower quadrant, size of large lemon, fairly firm and

hilus shadow on either side and slight thickening of all lung markings. Diagnosis Pleurisy at left base, indeterminate (Fig 437). The abdomen was flat and symmetric. No evidence of fluid musculature good. Palpation negative, except for a firm, irregular mass in the lower right quadrant, about the size of a large lemon which was tender on pressure and fairly



Fig 438 --Case I Six hour film showing marked filling defect and intolerance of the distal cecum

movable within a limited area indicating that it was connected with the intestinal tract, probably the cecum. His temperature usually normal in the morning, would reach  $38^{\circ}\text{C}$  in the afternoon. His pulse varied between 70 and 90. Red blood cells 3 006 000 white blood cells 8600. Differential blood count showed 43 per cent polymorphonuclears and 33 per cent

tine was apparently normal, as was the peritoneum generally, the disease process being limited to the cecal region and the neighboring glands. The cecum, most of the ascending colon, about 10 cm. of the terminal ileum, and the adjacent glands were mobilized and resected. The cut ends of the colon and ileum were turned in and a lateral anastomosis between the terminal ileum and the transverse colon was made. The defect in the



Fig 440—Case I. Photograph of specimen laid open showing normal mucosa with tumor mass at ileocecal valve.

posterior layer of peritoneum was repaired and the abdomen closed, leaving a small rubber tissue drain between the subcutaneous tissue and external rectus sheath. The patient stood the operation very well and was returned to the ward in good condition.

*Pathologic Report.*—*Gross* (Figs. 439 and 440): On section the lumen of the gut is greatly narrowed. The cecal wall,

movable with slight coinciding tenderness. No notable stomach findings.

3 Tumor of cecum giving gross filling defect of distal cecum and proximal ascending colon and coinciding with palpable mass resulting in cecal hypermotility (Fig 438). Question whether pathologic nature of the tumor is neoplastic or inflammatory. General contour consistency and tenderness more in favor of adenomatous neoplasm however such could be simulated by gummatous type of lues. Tuberculosis suggested by hypermotility and intolerance of cecum without however the reactive irritation that would accompany same. Terminal cecum shows stasis.

4 Appendix visualized poorly filled and showing contracted lumen.

*Conclusions*—The tumor is of cecum with evidence in favor of neoplastic origin. The situation is one requiring operative interference. The barium enema shows canalization of entire colon except cecum. The cecum shows a gross filling defect coinciding with right border of mass which is palpable with difficulty when abdomen is distended by enema.

You will note that the etiologic diagnosis was considerably in doubt but the indications for operation were clear and definite. It was practically an operation of necessity.

*Operation* (April 19 1924)—Under ether anesthesia the abdomen was opened by an incision through the right rectus muscle. There was no free fluid. Parietal peritoneum not thickened. Upper abdomen negative. The cecum which presented was thickened and edematous and the seat of an extensive tumefaction which involved the entire cecum a portion of the ascending colon and the ileocecal valve. The terminal portion of the ileum was not definitely involved. The tumor was hard and in this respect not unlike carcinoma but the neighboring intestinal serosa had the grayish mottled appearance of tuberculosis and the neighboring mesenteric glands were enlarged. One of them the size of a small hen's egg was broken during the manipulation and was definitely caseous. The retroperitoneal glands were likewise involved. The rest of the intes-

including the ileocecal valve, is tremendously thickened and has the colloid appearance often seen in carcinoma. The mucosa is grossly intact. The layers beneath the mucosa are replaced by firm white fibrous tissue in which are several localized areas of yellowish tissue resembling necrotic tuberculous material. The



Fig. 442—Case 1. x Ray of colon, three weeks after operation, showing anastomosis patent and functioning.

terminal ileum is apparently uninvolved. The glands show typical caseous degeneration. *Microscopic* (Fig. 441): All sections of the intestinal wall show the mucosa fairly intact. The submucosa and muscularis are greatly infiltrated with vast numbers of lymphocytes, wandering cells, and some eosinophils.





Fig. 441.—Case I. Drawing from microscopic section through the wall of the cecum showing relatively intact mucosa. Marked infiltration of the submucosa and muscularis. Many typical tubercles with giant-cells.

group. We have been particularly interested for the past year or more in an effort to do something for those patients with pulmonary tuberculosis who have developed cecal disease. Practically all of them have been under treatment for advanced lung conditions, and their progress has been checked by tuberculous ulceration of the intestine. This interferes with the gastro-intestinal digestion and almost certainly consigns them to hopelessness. The condition has generally been considered a terminal event and efforts at treatment of no avail. Through the efforts of Dr. J. W. Larimore, and at his suggestion, many of these patients have had gastro-intestinal x-ray studies, and in several cases the lesion has been found by x-ray study to be sufficiently localized to warrant excision. They have ordinarily been considered poor surgical risks and interference has not been recommended, but we feel that we have demonstrated that operation is possible and certainly warranted in view of the hopelessness of any other measures. This young woman came to us just a year ago from the Koch Hospital where she had been under treatment for pulmonary tuberculosis for more than a year previously. She was a typist, nineteen years old, single, and entered the Barnes Hospital August 3, 1924. She was first admitted to the St. Louis City Hospital in April, 1923, complaining of a cough, loss of weight, night-sweats, and expectoration. Her family history was unimportant. She had had the usual diseases of childhood and influenza in 1918. A diagnosis of bilateral pulmonary tuberculosis was made, and she was transferred to the Koch Hospital. Shortly after this she began to complain of cramps in the lower abdomen, with occasional spells of vomiting. There was no constipation or diarrhea. It became evident after several months of hospital treatment that she was not making satisfactory progress. She had improved to a certain point, but because of her gastro-intestinal symptoms she was unable to take her food properly and her improvement did not continue as it usually does. She was thereupon transferred to the Barnes Hospital for a complete gastro-intestinal study, with the idea of possible operation. Her general appearance was good. Skin and mucous membranes good color.

Many typical tubercles are seen with giant cells. The glands on section show large masses of tuberculous necrotic material.

*Postoperative Course*—The patient made a fairly uneventful recovery. A few days after operation he had some chest findings, with cough, some temperature elevation, and leukocytosis, which was interpreted as a bronchitis. This subsided within a few days. There was a mild superficial infection in the wound, but it healed satisfactorily. The skin sutures were removed on the eighth day and the stay sutures on the twelfth. We have since stopped the use of any drainage in these cases, and find that, with careful technic, the wounds can be closed completely and primary union obtained. His bowels moved spontaneously on the third day, and his diet, though restricted, was ample. He began taking soft food on the fourth day. He left the hospital on the twenty first postoperative day. His abdominal symptoms had subsided and his general condition was good. Two days before leaving the hospital he was given a barium enema in which the anastomosis was demonstrated as patent with excellent functional relations and intestinal hypermotility (Fig 442).

You see this patient today, more than a year after operation, entirely relieved of his abdominal symptoms. He has been fairly active, working at intervals, and in fair condition. He still has enlarged cervical glands and a small sinus at the site of his wound which heals and then reopens from time to time. His chest is practically negative, but he doubtless has an active glandular tuberculosis. Social conditions have made it impossible for him to get the proper hygienic treatment, and with his present methods of living he stands a poor chance of getting well. He illustrates very well the type of case which Herrick calls tuberculoma, and for which operative treatment is quite generally recommended. There has been no recurrence of his abdominal trouble, and if we are successful in getting him the proper sort of care I feel that he might make a complete recovery.

**Case II**—Our second case represents an entirely different

group We have been particularly interested for the past year or more in an effort to do something for those patients with pulmonary tuberculosis who have developed cecal disease Practically all of them have been under treatment for advanced lung conditions and their progress has been checked by tuberculous ulceration of the intestine This interferes with the gastro intestinal digestion and almost certainly consigns them to hopelessness The condition has generally been considered a terminal event and efforts at treatment of no avail Through the efforts of Dr J W Larimore, and at his suggestion, many of these patients have had gastro intestinal x ray studies, and in several cases the lesion has been found by x ray study to be sufficiently localized to warrant excision They have ordinarily been considered poor surgical risks and interference has not been recommended but we feel that we have demonstrated that operation is possible and certainly warranted in view of the hopelessness of any other measures This young woman came to us just a year ago from the Koch Hospital where she had been under treatment for pulmonary tuberculosis for more than a year previously She was a typist, nineteen years old, single, and entered the Barnes Hospital August 3 1924 She was first admitted to the St Louis City Hospital in April 1923, complaining of a cough, loss of weight, night sweats and expectoration Her family history was unimportant She had had the usual diseases of childhood and influenza in 1918 A diagnosis of bilateral pulmonary tuberculosis was made, and she was transferred to the Koch Hospital Shortly after this she began to complain of cramps in the lower abdomen, with occasional spells of vomiting There was no constipation or diarrhea It became evident after several months of hospital treatment that she was not making satisfactory progress She had improved to a certain point, but because of her gastro intestinal symptoms she was unable to take her food properly and her improvement did not continue as it usually does She was thereupon transferred to the Barnes Hospital for a complete gastro intestinal study, with the idea of possible operation Her general appearance was good Skin and mucous membranes good color

Temperature varied between 37° and 38° C. Red blood cells 4,200,000, white blood cells 9000. Urine negative. Functional kidney test 50 per cent in two hours. Blood pressure 105/65. There was no general glandular disease. Examination of the



Fig. 443—Case II. X Ray of chest showing extensive bilateral pulmonary disease.

chest showed bilateral pulmonary involvement with evidences of cavitation. The X ray examination of the chest (Dr. Sherwood Moore—Fig. 443) follows. Marked increase in hilus shadow on either side coextensive with the upper limits of each hilus and occupying the upper third of each lung field there is marked

infiltration of coarse flocculent parenchymatous mottling, bearing a definite relationship to the thickened lung markings. Throughout the remainder of each lung field there is extensive parenchymatous mottling. Cardiac shadow dislocated to left. Within the circle of the first rib and the first and second interspaces on the left are numerous structureless areas, indicative of cavities. Similar appearance beneath the first rib on the right.



Fig 444—Case II Six-hour film showing atypical cecocolon. Cecum fairly tolerant to barium. The ascending colon shows a marked ahaustral contour.

*Diagnosis.*—Pulmonary tuberculosis, fibroid type, with cavitation.

Examination of the abdomen was essentially negative except for marked tenderness in the lower right quadrant with definite induration in cecal region, but no mass. No distention,

no evidence of fluid Gastro intestinal x ray examination by Dr Larimore (Figs 444 and 445)

1 Stomach corresponds to habitus

2 Case examined on clinical diagnosis of ileocecal tuberculosis secondary to pulmonary tuberculosis at present regressive

3 Gastric motor insufficiency (first degree) functional



Fig 445—Case II Another s x hour film showing constriction at the junction of the cecum and ascending colon and atypical cecal contour

4 Colonic conditions

(a) *Proximal colonic hypermotility*

(b) Cecocolon is atypical in form and contour and in the barium enema shows constriction at junction of cecum and ascending colon fairly definitely pathologic Ascending and proximal two-fifths of transverse colon has an ahaustral contour and is fairly characteristic of involvement of the mucosal surface

(c) Palpable induration of right lower quadrant coincides with cecum and definitely of greater extent than bariumized lumen, and definitely indicates thickening of intestinal wall

(d) The cecum is fairly tolerant to barium and peristalsis was elicited only after extended palpation and coincident with a large clearance from terminal ileum

(e) Incompetent ileocecal valve The valve is well divulsed by hyperperistalsis of terminal ileum

5 Appendix visualized, filled in proximal portion only, and palpable even in its unbariumized portion with tenderness (second degree) coinciding Cecum and terminal ileum are freely movable

6 Spleen visualized, not enlarged

*Conclusions*—The evidence is conclusive of pathologic involvement of cecum, ileocecal valve, and appendix, most probably of tuberculous etiology Involvement of ascending and proximal transverse colon is highly suggestive, but not conclusive There is apparently no extra alimentary extension and the cecum and terminal ileum should be readily resectible

We had to deal, therefore with a patient who had an extensive bilateral tuberculosis of the lungs, who had been under treatment in a modern sanatorium for more than a year, and who had reached a certain stage of improvement beyond which she was unable to progress This was unquestionably due to an ulcerative process in the cecum secondary to the pulmonary infection, which made impossible the proper assimilation of food, an essential factor in the treatment of her disease Obviously, in such cases the outlook is hopeless unless the intestinal condition can be eliminated, and we feel that in selected cases, where the lesion is not too extensive, its removal should be undertaken

She was operated on August 11, 1924 Under morphin scopolamin seminarcois and local anesthesia the abdomen was opened through a right rectus incision There was no free fluid and no general peritoneal involvement The cecum was readily delivered The appendix was thick, indurated, and stiff The induration involved the entire cecum, which was mottled and



covered with fibrin, and extended upward almost to the hepatic flexure. There were some moderately enlarged glands in the mesentery, but none of them had undergone caseous degeneration. The terminal ileum and the rest of the intestinal tract appeared normal. The terminal ileum, cecum, and ascending colon well above the involved portion were resected. The ends were turned in and a lateral anastomosis was made. It was



Fig. 446—Case II. Photograph of specimen showing terminal ileum, cecum and appendix.

necessary to give nitrous oxid during the mobilization and excision of the bowel but no ether. After mobilizing the part to be removed the operation was practically extraperitoneal. The wound was very carefully protected and after completion of the anastomosis there was a complete change of packs, linen, gowns, gloves, and instruments. The wound was closed without drainage. By following this technic in a considerable number of

cases we have had no wound infections. The patient was awake on leaving the operating room and returned to the ward in good condition.

The gross specimen (Figs 446 and 447) showed the wall of the cecum moderately thickened, including the appendix. The mucosa presented a moth eaten appearance, with innumerable small ulcers. No healthy looking mucosa was seen. Many



Fig 447 —Case II. Photograph of specimen laid open showing diffuse ulceration of the cecal mucosa. The mucosa of the ileum is intact.

small white areas were seen which resembled tubercles. The microscopic sections (Fig 448) showed areas in which the mucosa was missing and replaced by areas of ulceration. There was marked infiltration of the mucosa with round-cells and eosinophils, and scattered throughout the submucosa were typical tubercles composed of epithelioid cells and surrounded by a rim of lymphocytes. Some of these contained giant-cells. Giant-cells were also scattered throughout the submucosa. The

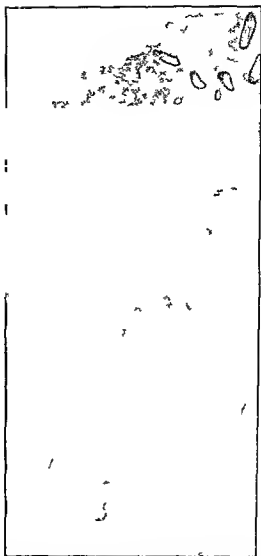


Fig. 448—Case II. Drawing of microscopic section through the wall of the cecum at the edge of an ulcer showing destruction of the mucous membrane. There is infiltration of the mucosa and scattered throughout the submucosa are typical tubercles with giant cells.

lymph nodes showed typical tubercles and giant cells. Sections of the ileum were negative. The appendix showed merely a

round cell infiltration of the submucosa with areas of necrosis, but no typical tubercles

*Diagnosis*—Tuberculosis of cecum Tuberculous lymphadenitis Chronic inflammation of the appendix

The patient made an uneventful recovery from her operation The wound healed *per primam* There was some temperature reaction for the first few days, but after the seventh day it became practically normal and remained so The abdominal condition rapidly improved and her bowels moved normally after the third day She developed a good appetite and was able to handle a restricted diet without discomfort She left the hospital on the 25th postoperative day and was returned to the Koch Hospital where her treatment was to be continued She is still a patient there one year later and has been making fairly satisfactory progress She has had no further abdominal trouble With such an advanced pulmonary condition, of course, the prognosis as to a cure is doubtful, but she is gaining weight and the disease is apparently arrested Recent x ray examinations of the gastro intestinal tract show admirable conditions, with no evidence of recurrence or extension of the disease We feel that she now has a fair chance of recovery, whereas she had none before

We have operated for this particular type of cecal tuberculosis five times in the past year, with one operative mortality All were young women with advanced pulmonary disease Six years ago, on opening the abdomen for a supposed acute appendix in a young woman with pulmonary tuberculosis, we came upon just such a condition, and did a resection She made a good recovery and is at present living in Colorado leading a fairly active life

We believe that the co operation of the surgeon with the chest man and the gastro enterologist will very materially change the prognosis in these otherwise hopeless cases of tuberculosis It has been with the co operation of Dr J W Larimore, Gastro enterologist to the Barnes Hospital and the St Louis Koch Hospital for Tuberculosis, and Dr J F Bredeck, Tuberculosis Comptroller of the City of St Louis, that these studies have been begun



## CLINIC OF DR JOHN R CAULK

### BARNES HOSPITAL

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#### HORSESHOE KIDNEY<sup>1</sup>

I SHALL present to you this morning 2 cases representing the same type of renal anomaly, but presenting different pathologic aspects

Case I—Mrs S aged seventy four was seen in October, 1924, complaining of a large mass in the left side associated with pain, great weakness and occasional fever. Patient had been in good health except she had passed dirty urine and had been told she had pus in her urine for many years, but there had been only one time, seven years ago in which she was really sick, and at this time she had an attack of uremia. Just prior to this she had a glass bulb pessary inserted into her vagina which was removed by operation. She had suppression of urine with delirium and fever which lasted for several days but she recovered after extensive eliminative measures were instituted. She never passed blood and had no history of renal colic, but for some time suffered pain in the left side. Her general health was about as usual until two weeks before admission into the hospital, when she noticed the mass in her left side gradually progressing in size. She was running a low grade fever, was quite weak, and had chilly sensations almost every day. On admission there was no frequency or pain on urination.

*Examination*—Well preserved old lady, somewhat pale blood pressure normal, large tender mass in the left side extending from the left lumbar region forward almost to the midline and down below the spine of the ilium, abdomen otherwise

<sup>1</sup> Clinic given to Fourth Year Students at Barnes Hospital Washington University Medical School May, 1925

negative. Pressure on this tender mass caused no pain across the abdomen and the patient had never had pain reflected to the other side. In fact the kidney had been symptomless as far as pain is concerned until the soreness of a few weeks ago.

Cystoscopic examination showed very dirty bladder urine, bladder mucosa normal and rather thick pus exuding from the left ureteral orifice. Neither of the catheters passed to each kidney went the full distance. Urine from the right was clear and normal and from the left very dirty. On account of the thickness of the pus the left kidney could not be emptied and a satisfactory pyelogram could not be made. Phthalein appeared on the right side in four minutes; in ten minutes it showed 10 per cent. There was none from the left or in the bladder. Pyelogram on the right side was lower than normal and closer to the midline and was of the elongated type with small aberrant calices. Ureter catheter on the left went inward near the midline and at the lower part of the sacrum turned abruptly outward over the iliac region then went upward to the midlumbar region. On account of the position of the ureter catheter the pyelogram on the right side and the low position of the mass which seemed to run to the midline the diagnosis of horseshoe kidney was made.

*Operation*—On October 30th under gas ether anesthesia a transverse incision was made over the mass and a very large pyonephrotic sac was drained. There was no attempt to determine the nature of the kidney at this time. Free drainage was instituted and in the course of ten days secondary nephrectomy was done. The kidney had shrunk considerably and was quite easily freed from surrounding structures and quickly determined to be horseshoe kidney the isthmus of which was completely fibrous and about  $\frac{1}{4}$  inch in width. The kidney was freed and a pedicle clamp applied to the isthmus was incised with cautery and sutured by running catgut stitch. There was no evidence or suspicion of tumor in the kidney. It appeared to be a typical pyonephrotic sac. The vessels to this kidney came directly downward from above to the upper pole evidently from the region

of the bifurcation. They were easily ligated, ureter was anterior and taut. The other half of the kidney appeared and felt entirely normal. Patient made a very rapid convalescence and left the hospital in three weeks with a small sinus. She did nicely for about two months. Then the wound became angry looking and red, bleeding very freely. She began to suffer with severe pain in her back and hips and the left side of the abdomen. This became so severe as to require large and repeated doses of morphin.

Quite promptly there appeared a mass to the right of the midline, which, within the course of a few weeks, grew to an enormous extent until it was as large as a head, completely filling the whole right abdomen. It was very hard and irregular. Patient gradually became weaker and died May 13, 1925. Pathologic report of the specimen removed showed carcinoma of the kidney in the upper part of the sac. The right portion of the kidney removed at partial autopsy showed an enormous carcinoma evidently originating at the isthmus, an extension from the left side. It was histologically the same as the section from the left portion.

Case II—Mr R., aged twenty, chief complaints repeated attacks of pain in the left kidney region occasional attacks on the right, chills, and fever. Family history negative. He had had the ordinary childhood infections scarlet fever when three years old with otitis media, acute streptococcic infection of the right knee and thigh at the age of sixteen, at which time he was seriously ill and required blood transfusion. He had a very slow recovery with a resultant ankylosis of the knee joint.

In January, 1924 he applied for insurance, and pus was found in his urine. Several months later he had an attack of pain in the left kidney with hematuria. These attacks occurred frequently on the left side. About six months ago he had severe pain on the right side in the region of the gall bladder believed by a competent internist to be a definite gall bladder colic. Pain at no time was in the back, nor did it radiate down the side. At this time a ray examination showed shadow in the region of



the left kidney or upper ureter and peculiar small crescentic shadows on the right side which simulated gall stones

In February of this year a complete urologic investigation was made. There was at this time considerable infection in the left kidney none in the right marked retention in the left. Pyelo ureterography showed stone to be localized in upper ureter. The pelvis of the kidney was lower than normal closer to the midline, elongated calices small stubby and aberrant, kidney shadow almost vertical and close to the midline. Shadows on the right side had developed to definite stones and were unquestionably renal. Pyelogram made the diagnosis certain. This was further verified by cholecystogram which showed shadows entirely out of line with the gall bladder.

On February 15th after this preliminary ureter catheterization and lavage and when the infection had materially cleared ureterotomy was done and a stone the size of a grain of corn was removed from the left upper ureter. Operation was quite simple since, as is common the ureter was anterior and easily accessible.

Convalescence was uneventful except for slight urinary leakage during a period of from three to ten days. The fistula then closed and remained closed permanently. There were several attacks of acute retention in this kidney following operation requiring catheter drainage. In fact, the patient was put on catheterizations with drainage and lavage approximately every five days for a long period. He did nicely and left the hospital until the present time when he was seized suddenly with another attack of colic on the left side with chills and fever, and with tenderness and some soreness on the right side. The urine was very dirty. Ureter catheter passed easily up left ureter and withdrew a considerable retention of infected urine. There was marked tenderness on the right side and some on the left. The right kidney was at this time infected also and there was retention to a less degree in its pelvis. Urine from the left kidney cleared up promptly. The right side did not respond and the patient began running an irregular fever suffering with evidences of a right sided renal block. I realized the seriousness of attempting the removal of the coral stone and the multiple

stones in this right side of the horseshoe kidney, and made every effort to protect the patient against such operation, but palliative treatment did not relieve his symptoms, and an operation, in spite of its seriousness has become necessary.

The removal of multiple soft stones from a normally placed kidney where exposure and delivery are easy is at times very treacherous since the complete removal of all fragments in many instances is very difficult and sometimes impossible. It is for this reason that the silent stone of this type is let alone. In this case the kidney is markedly fixed, very large and probably impossible of delivery but owing to the progressive symptoms it is essential that this portion of the kidney be opened and drained and an attempt made to remove the stones as completely as possible. Function of each side of this kidney is practically normal, at first when both were infected the function was materially impaired, as is usually the case, but since the acute retention has been controlled and relieved of its acuteness there has been a marked resumption of its function. Blood nitrogen is normal. Patient's general condition is good. We will therefore this morning remove the stones from this side of the horseshoe kidney.

*Operation*—Under gas oxygen ether anesthesia patient in lateral position but not as pronounced as for the ordinary normally placed kidney. Since this kidney is much lower and the pelvis is anterior, we will make a transverse incision from the middle of the lumbar region running forward and slightly downward to near the middle line. We are now cutting through the muscles and fascia. Kidney presents itself, not surrounded by the usual perinephritic fat but it is much lower and more anterior than usual. The adrenal is not visible as is the case of all ectopic kidneys. Kidney is very large firmly fixed almost impossible of being lifted into the wound unless resection becomes necessary. We will open the pelvis, which is as you see, anterior to the kidney and remove the stones which are definitely palpable. Pelvis is open one rather large stone is removed, quite soft, pelvis is filled with smaller stones and impacted with sand. We are blocking the ureter to prevent the

fragments of stone or sand getting into it. I now have my finger in the renal pelvis and find there are innumerable stones filling the various calices and the pelvis proper. For this it will be necessary to make multiple incisions in the renal substance which you know, is known as nephrotomy or nephrolithotomy. It is often wiser to make two or three smaller nephrotomy incisions than one large opening and in this case where the kidney is impossible of being delivered into the wound the smaller openings are almost imperative. Through these openings I will attempt to remove the stones and fragments as far as possible and then thoroughly lavage the kidney in order to wash out the small fragments and sand and rid the pelvis of every particle of concretion possible. This is a most important measure in any type of soft pelvic stone particularly with sandy impactions, as are seen so frequently in this part of the country.

As far as I am able to determine the pelvis is now free of stones and sand although one can never be certain unless a fluoroscopic is done at the time of operation or a film made. In this instance it would be impossible to do either of these which is our custom on account of the fact that the kidney cannot be delivered. I will close the pelvis carefully and drain the kidney in two places through the nephrotomy incisions and, as usual will drain down to the kidney with cigarette drains. Wound is now being closed as is customary, by continuous suture of the deep aponeurosis and another stitch for muscles and superficial fascia. Skin is closed separately with silk.

*Postoperative Course*—Kidney was drained for ten days tubes were removed, patient had an uneventful convalescence ureter catheter drainage to kidney with washing at end of first week and repeated every five or six days. Patient left the hospital in about three and a half weeks with a discharging sinus which drains a little pus. X Ray shows a very small pale shadow in the lower pole of the right kidney. Considering the numerous stones and large amount of sandy impaction this result is very satisfactory. The urine is perfectly clear and the patient has gained a great deal in weight and strength.

## DISCUSSION

The developmental condition is in itself quite rare and I am happy to have demonstrated to you an operation upon, and a specimen of another which has been removed at operation. The anomaly known as horseshoe kidney, as its name implies, is a kidney the gross appearance of which resembles a horseshoe. It is due to defects in embryologic development whereby the two kidneys instead of maturing separately and going to their normal resting places, unite across the midline of the body usually by means of the lower poles, very rarely by the upper

The renal buds with their metanephric caps, instead of developing into separate kidneys, come in contact across the midline. This fusion is usually anterior to the big vessels, and, as was previously stated, usually at the lower poles. This union usually prohibits the proper ascent of the kidney and is responsible for a lower implantation of the organ. It also interferes with normal rotation, so that the position of the lateral aspects of such a kidney is quite different from those normally developed, and the ureters and vessels usually, for this reason, come off on the anterior part of the organ. The connecting band, known as the isthmus, may consist either of parenchymatous or pure connective tissue. This anomaly occurs about once in 1000 cases. Kuster's statistics show one in 1100, Morris 0.06 per cent of all cases, Socin 0.03 per cent, and Davidson 0.10 per cent.

Considering the rarity of this condition, it is quite fortunate for you to have brought to your attention these 2 clinical cases, since men doing special surgical or urologic work may go a life time without observing a single instance. These 2 patients are the only cases of horseshoe kidney that I have operated in a series of over 450 kidney operations. I have seen 3 other cases, making a total of 5, in which this clinical diagnosis has been made.

It is only in recent years that the diagnosis of such a condition has been definitely possible during life. Most of the earlier reports were autopsy findings and were really curiosities. With

the progress of abdominal surgery and occasionally during surgery of the urinary tract this type of kidney was more frequently encountered. Since the development of urologic studies particularly by means of the ureter catheter and x ray the diagnosis of this condition has been more frequently made and as one becomes more and more familiar with technic particularly urography it should be quite accurate. I shall later on give you the various findings. Dr D N Eisendrath of Chicago has done a great deal of work on this subject and I am very much obliged to him for the reports and data which he kindly sent me. A recent paper by Dr Rathburn of Brooklyn which was published in the Journal of Urology December 1924 goes very fully into the clinical aspects of this condition and is decidedly worthy of your perusal. He collects 108 cases from the literature of these only 24 were diagnosed before operation the remaining 84 were found during the course of surgery. 4 of the 24 patients who were diagnosed prior to operation had the diagnosis established by palpation the mass being felt on each side of the vertebral column with a band across the midline. Such a diagnosis could only be made in a very thin individual. As an illustration of the progress in diagnosing this condition in 1922 Judd Brasch and Scholl of the Mayo Clinic reported 16 cases in which 8 were diagnosed previous to operation.

The symptoms of horseshoe kidney of course are variable and depend upon the pathologic conditions present many cases are symptomless and are found accidentally during the course of routine urologic examination. In Dr Rathburn's tabulation of 108 cases the symptoms were pain in 31 and tumor in 21. One of the early symptoms described by Rovsing is pain across the abdomen relieved by the recumbent position and referred from one kidney to the other. This symptom has not been noted in any of my cases. All of the pathologic conditions to which a kidney is subjected may be found in this anomaly. In the 108 cases analyzed by Dr Rathburn there were Calculus 37 hydronephrosis 18 pyonephrosis 11 tuberculosis 12 tumor 4. Other less common conditions were polycystic disease

pyelitis ureteral calculus fistula The patient I have just shown you presents a very serious condition, in that he had numerous stones in the right kidney pelvis plus a large coral stone associated with a pyelonephritis, a stone in the left ureter associated also with pyelonephritis with considerable pelvic retention has just recently been removed The first patient whose specimen I presented to you was very interesting in that there was an enormous calculus pyonephrosis with a small area of carcinoma in the upper part of the sac Let me call your attention to the diagnostic findings in such a condition You know quite well that the normal kidneys lie in the loins, with the pelvis opposite the second transverse process the left a little higher than the right the calices pointing outward usually in an orderly fashion In a normal x ray plate the kidney shadow shows with its inner border closer to the spine at its upper pole than at the lower and the lower pole is usually quite distinct, whereas, in the horseshoe kidney the shadow is usually much lower and the normal angle is transformed so that the lower pole comes closer to the midline than the upper and there is usually not the distinct outline of the lower pole

In ureter catheterization it may be observed that the kidney is reached at a shorter distance than ordinarily This, of course, is due to the shortening of the ureter both from its anterior insertion and from the lower position of the kidney, the catheters are seen to be closer to the midline by x ray The most valuable aid in such a diagnosis is by means of pyelo ureterography There are several points of great importance which if properly interpreted should allow the diagnostician to make a positive diagnosis in a large percentage of cases In the first place, the pelves are lower, they are more closely applied to the midline, are quite bizarre in their appearance, the most frequent type I have seen has been the elongated pelvis running almost vertically in which the ureter seems to run into the lower portion, the pelves go directly upward from this and the calices are usually short and stumpy and frequently absent In neither of these patients did they point toward the midline In one of my patients the calices pointed toward the midline, a condi

tion which has been described by other observers. Such findings will usually establish a positive diagnosis.

I will cite to you, however, the findings in a recent study of a patient suffering with a pyonephrosis of the left side with the kidney lower down than is commonly seen, there were double pelves on the right side. Owing to the large pyonephrosis with its inspissated content it was impossible to relieve the retention by catheter drainage but another urologist had done a pyelogram before the patient came under my care, and this pyelogram, while indistinct owing to the inspissated pus in the sac, showed in one place a typical major renal calyx with what appeared to be two minor calices pointing toward the midline. For this reason I felt quite sure of the possibility of a horseshoe kidney, except for the fact that the other pelvis was normally placed. This pyelogram simulating a horseshoe kidney was an artefact due to the iodid solution in the presence of the pus.

#### SURGERY

Surgery on the horseshoe kidney is far more difficult than on the normally placed organ. However, the heminephrectomy which I did for the calculus pyonephrosis with carcinoma was quite simple and was enucleated as easily as an ordinary kidney, whereas the operation upon the renal calculus was extremely difficult. In Rathburn's collection of cases there were 52 heminephrectomies, with a mortality of 14 per cent, 18 pyelotomies, with 1 death, 9 nephrotomies with 2 deaths. There were 6 operations which consisted in the division of the isthmus, with 1 death. There were other scattered cases, such as decapsulation, liberation of adhesions, ureterotomies, etc. He also reports 20 cases found at exploration. It is thus seen that the general mortality on the surgery of the horseshoe kidney is strikingly high. However, I am impressed, after these two operations, with the fact that such a mortality is really unwarranted at the present time in the hands of the trained surgeon. The question of treatment of the stump of the isthmus in case of heminephrectomy, of course, varies in different cases. With a fibrous isthmus, as in my case of heminephrectomy, the resection is very

simple. The isthmus was about  $\frac{1}{4}$  inch wide and composed of fibrous tissue. It was removed by clamp and cautery and a running suture applied. In the case which Dr. Elmer Hess reported the removal was entirely by clamp and cautery without suture. He calls attention to the fact there was no fistula and only slight urinary leakage for a few days. Dr. Rathburn calls attention to very careful technic in closing over the ends of the parenchymatous bridge in order to prevent postoperative fistula. A normal line of cleavage should be sought and the raw surface of the kidney should be covered with capsule, fat, fascia, or free fat transplant. Some authors advocate the dove-tail incision. It seems that fistula is more frequent following pyelotomy on such a kidney, and efforts should be made to prevent it, such as proper and careful closure with superimposed fat flaps. In this patient which I have shown you this morning there was leakage for a short time from the ureterotomy incision, but it promptly closed, reopened several times owing to the infection, and finally closed after ureter catheter drainage had cleared the renal infection.

Surgery on the horseshoe kidney is made tedious because the kidney is usually quite large, immovable, fixed to surrounding structures, the vessels may be quite aberrant and usually taut, so that one has to make very careful exposure. I made in both of these cases a low incision running anteriorly across the abdomen to the rectus muscle, and found it aided a great deal in the proper exposure of the kidney. Most of the surgery and the danger is near the midline, and for this reason the anterior incision, to my mind, is much more preferable. In the case of multiple stones with infection, as this young man had on the right side, we were dealing with a very treacherous problem, and for this reason free exposure by pyelotomy and multiple nephrotomy incisions was necessary in order to thoroughly explore the kidney and lavage it. In these cases, as well as in any type of postoperative kidney with infection and stone, repeated renal lavage in postoperative attention is essential. We shall catheterize this young man's ureters at least twice a week and lavage them thoroughly for some time. This



is the one important factor in the prevention of recurrent stone

The mere fact of removing a calculus does not insure a cure the postoperative care is extremely important and must never be neglected. It is our custom in this clinic to follow these patients very carefully by giving them ureteral dilatations and pelvic instillations along with internal urinary antiseptics and corrective diet until we are reasonably certain that all granulations are removed and infection eliminated. In these infections renal drainage is equally as important beforehand not only to improve the diseased kidney if possible but for the relief of toxemia and the toxic interference with the healthy side. This boy had a severe double infection with retention and has been on repeated washes for a long time before he came to surgery. At one time it looked as though he would require a heminephrectomy on the left side where the small calculus was blocking the ureter but with care and patience the ureter was unblocked and the function which was apparently nothing came back to within normal limits.

The points of interest in the first case are the association of carcinoma in a very large pyonephrotic half of a horseshoe kidney which was removed by secondary nephrectomy. At the previous operation of drainage (nephrotomy) at least a quart of pus and numerous calculi and sand were removed. There was no suspicion that there was a carcinoma in this kidney; it was only after pathologic sections of the upper wall of the sac that the diagnosis was determined. The rapid spread of this tumor through the fibrous isthmus which had been incised and the enormous growth which it produced in such a short time were quite extraordinary. The terrific lumbosacral pains were the most severe I have ever seen in any type of metastatic carcinoma. The excessive bleeding from her wound at the slightest touch was out of the ordinary.

## CLINIC OF DR LEROY C ABBOTT

SHRINERS HOSPITAL FOR CRIPPLED CHILDREN

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### THE TREATMENT OF CONGENITAL CLUB FOOT

CLUB FOOT is the term usually applied to the deformity of the foot characterized by plantar flexion inversion and adduction. The condition may be congenital or acquired. Today however we are concerned only with the congenital variety and more especially are we to consider a group of cases in which the ideal time for establishing complete anatomic and functional cure has long since passed. The importance of early treatment and the increasing difficulty of effecting a cure as the child advances in age is best appreciated by a brief review of the pathologic anatomy.

#### PATHOLOGIC ANATOMY

In infancy the foot is twisted so that the plantar surface looks backward inward and downward and the dorsal surface looks forward outward and upward. This position causes a forward displacement of the astragalus so that it projects on the dorsolateral surface of the foot. The external malleolus appears unduly prominent while the internal malleolus is obscured by the redundant tissue on the inner aspect of the foot. The structures which offer the greatest resistance to correction of the deformity are the ligaments which bind together the internal malleolus os calcis and scaphoid. The muscles which assist in fixing the foot in its abnormal position are the tibialis anticus and the tibialis posticus. Changes in the bones of the tarsus are of minor importance and they consist largely of an altered relation to one another. Therefore in the ordinary club foot in infancy the deformity of the foot is maintained by contracture

of the soft parts and not by any marked pathologic changes in the bones of the tarsus

In young children who have not received treatment we have quite a different picture. Here growth and functional use of the part have produced changes in the external contour of the bones and in accordance with Wolff's law corresponding changes have taken place in their internal structure. These are adaptations to functional use of the foot in its position of deformity.

The changes in the various bones of the tarsus are as follows.

The astragalus is displaced so that a large portion of its body has escaped from between the malleoli, its neck is often bent downward and inward. The scaphoid is displaced inward from its normal relation with the anterior surface of the head of the astragalus and articulates only with its inner portion. The os calcis is plantar flexed, rotated inward, and in place of lying to the outer side of the astragalus it has moved to a position directly beneath this bone. The cuboid is displaced inward and upward. The ligaments connecting the internal malleolus, scaphoid and os calcis have been converted into a fibrocartilaginous mass called by Parker 'the astragaloscaphoid capsule'. It offers great resistance to correction of the deformity.

Of the secondary deformities the most important are genu valgum (knock knee) and an inward rotation of the tibia on the femur. At times there is an actual inward twist of the tibia which, if overlooked, may be a factor in causing a recurrence of the deformity.

The above changes are progressive in character, and if the child is walking the foot becomes locked in deformity not only by shortening of the soft parts but by structural alteration in its bony architecture.

#### TREATMENT

The indications for treatment are (1) Overcorrection of the deformity, which means marked abduction, eversion and dorsiflexion, (2) fixation in overcorrection until adaptive changes have taken place in the soft parts and bones of the tarsus and (3) exercises to strengthen the weakened muscles which dorsiflex

flex and evert the foot. In formulating a plan of treatment it is important to remember that club foot is a deformity of the entire tarsus and, therefore measures should be employed which are effective upon the whole foot. For this reason manipulation is far preferable to any method which is effective only on one part of the foot. It is a procedure which can be used with benefit in the treatment of club foot at any age. Though the most conservative of the various methods, it will be found to yield by far the highest number of complete anatomic and functional cures.

In infants manipulation can usually be given by the nurse or parent under the directions of the surgeon. Several times a day the foot should be abducted, everted, and dorsiflexed in the order named until it can be carried into a position of over correction. The procedure is more effective if, in the intervals between manipulations overcorrection is retained by adhesive strapping or splints.

At this age exercises are not practical and, therefore, some appliance to prevent recurrence of the deformity is usually necessary. For this purpose a splint or a removable plaster of Paris cast will be found useful. When the child begins to walk the splint is worn only at night. To deflect the body weight a lift is applied to the outer border of the sole of the shoe. No other appliance is necessary providing a careful observation has shown that the wear on the shoe is evenly distributed. Active and passive exercises in which the foot is fully abducted, everted and dorsiflexed should be carried out daily. The active treatment and the period of supervision may last for several years but if the above measures are thoroughly carried out the majority of cases will show complete restoration of form and function.

Club foot in later childhood and adolescence should be subjected to the same form of treatment. The foot is much more rigid however, and greater force is required to accomplish correction. In the hands of the experienced the Thomas wrench will be found a valuable adjunct. If used, the principle of its application laid down by Sir Robert Jones should be adhered

to strictly. In addition to thorough manipulation a subcutaneous section of the plantar fascia may be indicated to correct cavus deformity while the resistance to dorsiflexion may demand a plastic lengthening of the tendo achillis. This latter should not be done however until all other elements of the deformity have been completely corrected. If the foot cannot be forced into the overcorrected position at one sitting the manipulation should be repeated at intervals until the maximum amount of correction is obtained.

In a large majority of cases the method is surprisingly effective and it should be the primary procedure in all neglected and relapsed club feet. Even where it fails to obtain but a partial correction of the deformity and a secondary bone operation becomes necessary the amount of bone necessary to remove is reduced to the minimum. The majority of bone operations used as primary measures to correct club foot are to be condemned for they are often mutilating in character. Relapse after an operation of this kind is one of the most difficult conditions with which we have to deal and frequently the results obtained are far inferior to those secured by manipulation.

In those cases in which full correction cannot be secured by repeated manipulation operation becomes necessary but fortunately it is only supplemental in character. Of these operations there are many the best known of which are the bone wedge operation and the ligamentous operations of Ober and Elmslie. It is my desire today however to call your attention to the operation devised by Hoke for stabilization of the foot in infantile paralysis and modified by him to meet the needs of the congenital club foot. To my mind it has many advantages over the other types of operation a few of which I hope to make clear during the discussion of the cases which are to be presented.

In the majority of cases in which manipulation has failed to gain complete correction an examination will show a persistence of the varus deformity of the forefoot and the inverted position of the os calcis. Palpation will often reveal a depression between the internal malleolus and the scaphoid an area which in the normal foot is occupied by the head of the astragalus.

THIS depression is created by an inward displacement of the scaphoid, a position in which it is firmly fixed by ligaments which connect it with the internal malleolus and the os calcis. The principle of the modified Hoke operation is that through removal of the head of the astragalus by an osteotomy of its neck an admirable view of these important ligaments is obtained. They can then be freed from the tubercle of the scaphoid or, as Hoke advised, they can be completely excised. The scaphoid can then be rotated outward. Another and not the least important feature of the Hoke operation is that the head is replaced to the inner side of its former position, and by filling out the depression on the inner border of the foot it becomes a bony block which prevents adduction of the forefoot. Before the head is replaced however, it is well to correct the varus position of the os calcis by manipulation and, if necessary by freeing the ligaments which are attached to the sustentaculum tali and internal malleolus. At times the cuboid blocks complete abduction of the forefoot, and here it is advisable to remove a bony wedge from the calcaneocuboid joint or, better still, directly through the cuboid. Care should be taken not to injure the cartilage of the subastragalar and astragaloscaphoid joints. The object is to secure full correction of the deformity with as little disturbance as possible to the movement of the tarsal joints.

The postoperative treatment is similar to that which is used following manipulation. The object is to maintain an overcorrected position of the foot until strength has been restored to the weakened muscles which dorsiflex and evert the foot. Fixation in plaster is usually maintained for seven to eight weeks, and walking is then permitted with a lift applied to the outer portion of the sole so that with each step the foot is thrown into moderate eversion.

The effectiveness of manipulation combined with the modified Hoke operation is clearly shown in the following cases.

Case I—This patient, a male, aged eight, was admitted to this hospital on October 21, 1924. His chief complaint at that time was deformity of the left foot. The condition dated from

birth and in walking the weight was thrown upon the outer side of the foot. At three years of age the heel cord was cut and a brace applied which was worn for several months. He had never had any other treatment and he entered the hospital walking with a very marked deformity of foot which he stated was increasing.

The general examination of the patient was essentially negative. The local examination, as you will see from the photo

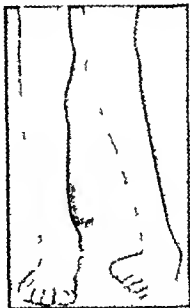


Fig. 449—Cas. I. Congenital equinovarus of the left foot in a child eight years of age.

graph taken on admission (Fig. 449) shows a very marked equinovarus deformity of the left foot. There was a large bursa on the lateral aspect of the cuboid due no doubt to the irritation of weight bearing. The astragalus was prominent on the dorsolateral aspect of the foot. No action could be elicited in the muscles which evert the foot, but the invertors were strong and when contracting they pulled the foot further into the deformed position. The gait was very awkward and a secondary knock knee had developed which is clearly shown in Fig. 449.

Our diagnosis was congenital equinovarus with marked contracture of the soft parts and structural alterations in the bony tarsus

As to treatment we decided that the boy should have the benefits of a thorough manipulation under anesthesia. This was done on October 23, 1924, and a subcutaneous plantar fasciotomy assisted in the correction of the cavus deformity. The foot was fixed in plaster until November 8, 1924, when an examination revealed the fact that while the major portion of the deformity was corrected, there remained a depression between the scaphoid and the anterior border of the internal malleolus. In other words, there was persistent adduction deformity of the forefoot. There was also some varus position of the os calcis. We decided, therefore, that a reconstructive operation on the tarsus was indicated, and on November 10th a modified Hoke operation was done. The head of the astragalus was removed and this showed the calcaneoscaphoid ligament which held the scaphoid fixed in its position of inward displacement. After freeing the insertion of the calcaneoscaphoid ligament into the tubercle of the scaphoid the adduction of the forefoot was corrected by manipulation. At the same time the varus position of the os calcis was overcome though not until a wedge of bone had been removed from the calcaneocuboid joint. The head of the astragalus was replaced to the inner side of its former position and fixed by a suture of catgut passing through its substance and through the skin on the inner border of the foot. Replacement of the head of the astragalus filled out the depression on the inner border of the foot. Closure of the wound was accomplished by catgut and silk. A plaster of Paris cast was applied extending from the mid thigh to the toes, holding the foot in the position of overcorrection.

The postoperative convalescence was uneventful. The stitches were removed on the tenth day and the wound was healed by first intention. The plaster-of-Paris cast was removed on December 28, 1924, seven weeks after the operation. A new plaster was then applied, and bivalved, so that exercises could be started to increase the strength of the muscles which



dorsiflex and evert the foot. Weight bearing was allowed in ordinary shoes with the addition of a lift  $\frac{3}{8}$  inch in thickness applied to the outer border of the sole of the left shoe.

The patient has been wearing the splint at night for a period of two months and he has also been treated in the gymnasium where the exercises have been thoroughly given. You will note that he walks with the foot held in excellent position (Fig 450) and that with each step the lift on the outer border of the sole causes slight eversion. Furthermore the muscles



Fig 450—Case I. Correction of deformity by manipulation and Hoke's operation.

have become strong enough to carry the foot into overcorrection. This is a very important factor in preventing recurrence of the deformity. Our advice to his parents when he leaves the hospital will be to continue the use of the night splint for several months and to carry out faithfully the active and passive exercises. A careful check should be kept on the position of his foot while walking. We shall see him again in a period of three months. The prognosis in this case should be excellent and the functional result should be very satisfactory.

Case II—This patient, a male, aged seven, was admitted to the hospital on October 7, 1924. The only important part of his history was that he had a deformity of the right foot since birth. His complaint, therefore, was largely one of disability due to the marked inward twist of the foot. As you will see from his photograph (Fig 451), taken at the time of his admission, there was a very marked equinovarus deformity of the right foot. The sole of the foot looked directly backward and you will note a large bursa overlying the outer tarsus, a prod

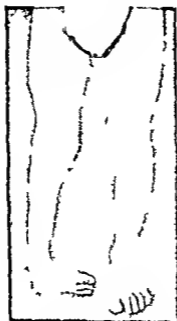


Fig 451—Case II. Extreme congenital equinovarus. Note prominence of external malleolus and large bursa due to irritation from weight bearing.

uct of irritation from weight bearing. Any attempt to passively correct the position of the foot met with failure. The patient could actively invert and dorsiflex the foot, but he had no power to bring the foot into the slightest eversion. There was a moderate atrophy of the muscles of the entire leg. Our diagnosis was congenital equinovarus of the right foot with marked structural deformity of the bones of the tarsus.

Our treatment consisted of manipulation with a Thomas wrench and plantar fasciotomy. The adduction and inversion

were corrected, but the plantar flexion could not be overcome because of the contracture of the tendo achillis. The foot was fixed in plaster of Paris until October 30th, when another manipulation was performed with a special attempt to correct the plantar flexion. It was noted at this time also that there remained considerable adduction of the forefoot with the usual depression between the scaphoid and the internal malleolus. No amount of manipulation could force the scaphoid into its



Fig. 452—Case II. After manipulation and Hoke's reconstructive operation on the tarsus. There is complete correction of deformity. Note straight inner border of foot.

normal relation with the head of the astragalus. The foot was again immobilized in plaster of Paris extending from mid thigh to the toes, and this fixation maintained for six weeks.

On December 11, 1924 the patient was given gas and oxygen anesthesia and the head and neck of the astragalus exposed by an oblique incision over the dorsolateral aspect of the foot. In the usual manner the head of the astragalus was removed.

and the astragaloscaphoid ligament excised. The foot was then manipulated until complete correction of the adduction deformity of the forefoot was secured. Without disturbing the cartilage on the head of the astragalus, it was replaced to the inner side of its former position and fixed in place by a catgut suture. The wound was closed with catgut and silk.

The convalescence from operation was uneventful. The stitches were removed on the tenth day and the wound was clean. The foot was immobilized for a period of seven weeks, when the plaster was hivalved, and examination showed that the forefoot deformity was corrected, but there remained considerable plantar flexion due to contracture of the tendo achillis. Exercises to stretch the tendo achillis were employed for several weeks, but they failed to give any great improvement.

On March 12, 1925 the tendo achillis was divided subcutaneously by the Bayer method and the foot was fixed at right angle dorsiflexion by a plaster of Paris cast. The plaster remained in position for six weeks. A course of physiotherapy was then given and has been continued up to the present time, some six months after the last operation. You will note from the photograph (Fig. 452) that there is complete correction of the deformity and that the patient bears weight on the entire sole of the foot. There is no longer any depression on the inner border of the foot, and examination of the shoe fails to disclose any wearing away of its outer border, a sure indication of beginning recurrence of the deformity. Furthermore, the patient can actively evert and dorsiflex the foot. The gait of the patient is better and function of the foot is improving daily.

Case III —A boy aged eleven, was admitted to this hospital on April 18, 1924, complaining of bilateral club foot. We learned from his history that the condition dated from birth and that he had had no treatment until he was two years of age. At this time a section of the muscles on the inner aspect of the soles of the feet was done, and this was followed by fixation in plaster for several months. He has had no other treatment and the operations do not seem to have benefited him. He sought

treatment because of the **great difficulty** in walking and the fact that the deformities were **increasing**.

The examination showed a **very severe grade** of bilateral club-foot. In walking the boy stood on the outer borders of the feet with the soles looking **directly backward** and inward. On each foot there was a large bursa corresponding to the area



Fig. 453 —Case III. Bilateral congenital equinovarus in a boy eleven years of age. The deformities were so marked that the soles of the feet looked directly backward.

where weight was borne. *The deformity was so extreme that when the patient walked it was necessary for him to carry one foot over the other in order to avoid interference.* The os calcis was held in marked varus, and in place of lying to the outer side of the astragalus it had moved to the position directly beneath this bone. Any attempt to manipulate the feet showed the deformity to be exceedingly rigid. The condition was equal on

both sides, as shown in the photograph (Fig. 453). An *x*-ray of the foot showed an inward twist of the forefoot. The bones of the tarsus were grossly misshaped and their normal relation to one another was greatly disturbed (Fig. 454).

On April 24, 1924 the feet were manipulated under anesthesia with a Thomas wrench. A partial correction of the deformity was obtained and immobilization was secured by plaster of Paris extending from mid thigh to the toes.

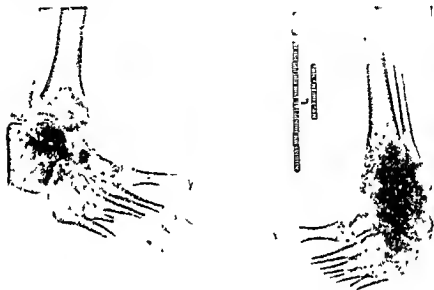


Fig 454.—Case III. *x*-Ray before treatment showing the misshaped bones of the tarsus, especially the os calcis and astragalus. The forefeet show a very marked varus. The structural changes are characteristic of club-foot in the older child.

On May 5th the right foot was operated upon by Hoke's method and the head of the astragalus removed by an osteotomy through its neck. The cuboid was displaced upward and inward and offered marked resistance to the correction of the varus position of the adduction of the forefoot. This necessitated a cuneiform osteotomy of the cuboid with the base of the wedge facing outward. The calcaneoscaphoid ligament was excised and the varus position of the os calcis corrected by manipulation. The plantar flexion of the os calcis was only partially

corrected. The wound was closed with catgut and silk and the foot fixed in a plaster of-Paris cast.

On May 26th the same type of operation was performed on the left foot. In both operations the wounds healed by first intention. Immobilization of the feet in solid plasters was con-



Fig. 455 —Case III. Correction by several manipulations and Hoke's operation on both feet.

tinued up to October 13, 1924, and during the past few months this fixation has been secured by bivalved plasters. Massage and exercises were given to facilitate active dorsiflexion and eversion of the foot.

At the present time you see him walking with ordinary shoes except that we have applied lifts  $\frac{1}{2}$  inch in thickness to the outer

borders of the soles. There is marked improvement in the bony architecture of the feet and their inner borders show excellent alignment (Fig 455). The gait is awkward and there remains plantar flexion and genu recurvatum on both sides. We have advised further treatment in the gymnasium as functional improvement continues. It is my opinion, however, that plastic lengthening of the tendo achillis on both sides will be necessary in order to relieve the deformities of plantar flexion and genu recurvatum.

Case IV—A boy, aged fourteen, was admitted to this hospital on May 20, 1924 because of bilateral congenital club feet. We found from the history that an attempt had been made to correct the deformity when the patient was three months of age. Several casts were applied. The patient did not walk until he was three years of age. When he was admitted to the hospital it was with the greatest difficulty that he could walk at all because of the very severe deformities of the feet. He stated that often after walking there was considerable pain in both feet and legs.

The local examination showed a very extreme degree of bilateral talipes equinovarus (Fig 456). There were large bursæ presenting over the cuboid bones and the bases of the fifth metatarsals. The deformity was so extreme that the patient in walking, in order to avoid interference, passed one foot directly over the other. Both feet were extremely rigid in the deformed position due to shortening of the soft parts on the inner aspect of the feet and to the very striking structural alterations in the tarsal bones.

This patient was given several manipulations with a Thomas wrench under anesthesia. These manipulations were done respectively on May 22d, June 5th, and 19th. The greatest of difficulty was experienced in correcting the adduction deformity of the forefeet and even after several manipulations their position in varus remained.

Operations were performed after the modified method of Hoke on the right foot July 7th, and on the left foot August 4th.



The principal points of each operation were excision of the calcaneoscaphoid ligament, thorough wrenching of the foot, and removal of a wedge from the cuboid with its base facing outward



Fig 456—Case IV Bilateral club-foot in a boy fourteen years of age Extreme deformities with feet turned directly backward Note large bursae over outer tarsus of both feet



Fig 457—Case IV After several manipulations and finally Hoke's operation on both feet The shoes are of the ordinary variety with lifts on the outer border of the soles Excellent functional result

The wounds were healed by first intention and fixation in solid plaster was continued until the middle of September He then wore bivalved plasters and received exercises to strengthen the muscles which evert and dorsiflex the feet He was also given

passive and active exercises to correct the knock-knee deformity and internal rotation of the tibia on the femur.

As you see him now (Fig. 457) he is able to stand with the entire soles of the feet upon the ground. There is no depression on the inner border of either foot and the patient can actively pull the feet into dorsiflexion and eversion. He is wearing ordinary shoes with the usual lift applied to the soles to prevent recurrence of the deformity.

### CONCLUSION

In conclusion I should like to emphasize that club-foot in infancy is maintained in its position of deformity largely by contracture of the soft parts. With growth and weight bearing the bones adapt themselves to the position in which they are used. The foot becomes fixed in deformity by the marked structural changes in the bones of the tarsus. These changes greatly increase the difficulties of securing complete correction of the deformity.

As to treatment, manipulation offers the best opportunity for cure in a large majority of cases. In a certain number of the more resistant club-feet of late childhood and adolescence manipulation fails to secure complete correction and some secondary operation is necessary. The operation which recommends itself is the one which is least destructive in character and which permits of complete correction without interference with joint function. The Hoke operation fully meets these conditions. The temporary removal of the head gives full exposure of the ligaments which resist correction of the deformity and, furthermore, it facilitates manipulation in the correction of varus position of the os calcis. Replacement of the head to the inner side of the foot is of the greatest importance in maintaining the foot in the overcorrected position.

Due emphasis must be placed on the importance of after-treatment in the prevention of recurrence of deformity.



## CLINIC OF DR. ELLIS FISCHER

FROM THE SURGICAL DEPARTMENT OF THE BARNARD FREE SKIN  
AND CANCER HOSPITAL

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### GIANT-CELL TUMOR OF THE JAW

I wish to present to you this morning one of the bizarre cases which not infrequently come to our clinic for treatment. She is a young Indian girl from the Quapaw reservation in Oklahoma. She is thirteen years old and gives the following history. When five years of age, while at play, she fell and struck her upper front edentulous gums on a stairway. The site of injury blistered a few days later and has remained an ulcerated, slowly growing tumor ever since. Tumor was operated upon five years ago and again later (exact date unknown), but has continued to grow. There has never been any pain connected with the growth of the tumor, and the patient has never had any difficulty in eating or speaking. Patient states she has never been sick except from this present trouble, and as far as she knows no one in her family has ever had a tumor. She has not yet menstruated.

On examination we find this enormous lobulated tumor protruding from the upper jaw, it involves the upper alveolar process from the second molar on the right to the first molar on the left, it has protruded forward and upward, pushing the nose and upper lip before it, it rises in a rather sharp ridge just below the infra-orbital ridge on both sides, while it is superficially ulcerated on its anterior inferior margin, for the most part the mucous membrane is intact. The soft tissues are not invaded, the bony hard growth evidently pushing them ahead of it in its growth. Cervical glands are palpable soft, and discrete, there is no evidence of visceral or other distant



without interference with structures whose physiologic function is necessary to life? second, is the general condition of the patient sufficiently good to warrant the assumption that the proposed magnitude of the operation will not kill the patient?

In the case before us the first of these questions is easily answered. None of the bony structure of the face or palate is essential to life, and even the amount of external mutilation contemplated should not keep this girl from pleasant association with other human beings. The second question is not so



Fig 459—Anterior view showing the lobulated and ulcerated surface of the tumor, the enormous stretching of the upper lip around the circumference of the tumor, and the mouth cavity

easily answered. While she is only slightly undernourished, she is much frightened, alone among strangers, and has had two unsuccessful operations before; her morale is not good. To balance this, she is of pure Indian breed and we will hope her sensibilities and perhaps sensitiveness to shock will not be as great as were she a Caucasian. Next to shock, hemorrhage is the chief risk from the operation. I believe by proper care this can be more or less controlled. At any rate, the operative risk is not considered out of pro-

portion to the therapeutic value of the procedure should the patient survive.

**Operation.**—Under ether anesthesia, and just as soon as the patient is quiet, we proceed to ligate both external carotid arteries immediately above the lingual branches. This is done through a more or less horizontal incision beginning at the posterior border of the sternomastoid muscle. We carry the



Fig 460—Inferior or palate view of specimen when removed the specimen consisted of the entire right alveolar arch, the malar process of the right superior maxilla, the anterior wall of the antrum, a portion of the nasal process, the nasal spine, the left alveolar arch to the second molar tooth, and the entire palatal process

incision about  $1\frac{1}{2}$  inches forward, passing a fingerbreadth beneath the angle of the jaw. The anterior border of the sternomastoid is easily identified, and then, by cutting through the deep fascia in the line of incision, the glistening tendon of the digastric muscle and its posterior belly are easily exposed. Now it is a simple matter to find the bifurcation of the common carotid. It is not so easy to differentiate the internal from the external branch. Their relative positions may be such as to

create confusion. That branch which lies lateral and at a deeper level in the wound may be assumed to be the internal carotid, but the only safe and unvarying guide is to identify arterial branches which can only come from the external carotid artery. The order in which the branches are given off beginning at the bifurcation are: superior thyroid, occipital, pharyngeal, lingual, and facial. We need not consider the higher branches, as it is our desire to ligate between the lingual and the facial. The lingual branch is the second large branch given off toward the midline. We pass our ligature immediately above this artery. On the right side a second ligature is passed, but not tied, around



Fig 461 —Profile view two years later

the common carotid artery. Both neck wounds are closed without drainage, care being taken to ligate all vessels caught by artery forceps. The ligature around the right common carotid is left long to be used as a temporary pressure control of circulation later in the operation. I have worked as rapidly as possible in order to minimize the amount of anesthetic. Now the neck wounds are covered with a towel wrung out from a 1:2000 mercuric cyanid solution. The head of the table is raised and the ether mask is removed. Raising the patient to the semi-erect position will prolong the effects of the anesthetic and also diminish the amount of expected hemorrhage. We now proceed to remove the tumor.



With a rather large, full-bellied knife a sweeping incision is made separating the reflection of the upper lip from the tumor. Next, by means of the periosteal elevator and knife, where cutting is necessary, all the soft tissues of the face are lifted up to the superior attachments of the tumor. Both nasal cavities are freely exposed by this maneuver. Now, while one assistant makes traction on the temporary suture around the right common carotid artery, with mallet and large chisel the tumor is literally knocked off from its attachments. As it has invaded the bones of the face, there is no definite line of demarcation, so I guide the chisel as deeply into normal bone as I dare. In



Fig. 462—Anterior view two years later

• spite of the preliminary ligation of arteries the hemorrhage is severe. It is controlled by large gauze packs while I inspect the specimen. I find that on the right side the cut surface represents the anterior wall of the maxillary sinus and the surrounding bone appears normal. On the left side the cut surface is simply very hard, dense bone indicative of incomplete removal. The packs are removed from the wound and with ordinary soldering irons at a dull-red heat the raw surface of bone is lightly touched on the right to help control hemorrhage and heavily applied to the left side, hoping to get enough heat penetration to destroy what tumor remains. Unfortunately, the condition of the

patient does not warrant prolonging this procedure to the desired extent. Wide strips of iodoform gauze are placed over the raw surface of bone and the face pulled down as well as possible into place. The actual removal of the tumor has required fifteen minutes, during six of which the cautery was applied. The patient's condition is very bad, but with proper measures immediately instituted to combat shock and hemorrhage (which is now well controlled) we can hope she will survive the operation.

*Subsequent Note*—The patient rallied satisfactorily from the immediate shock of the operation, but complete recovery from the resultant anemia was rather prolonged. Also there was considerable deformity of the soft tissues of the face. The upper lip did not shrink as much as had been expected, and the under surface of the right cheek adhered to the raw bone at a higher level than normal. The nose was abnormally spread out, and it, too, was placed too high on the face. Two subsequent plastic operations were performed to correct these deformities. The final result is best shown in Figs 461 and 462.

The histologic examination of sections from various parts of the tumor showed numerous giant cells throughout, with tremendous production of old and new formed bone.

Since the operative removal of the entire tumor was considered incomplete, the patient was given the benefit of the maximum amount of radiation considered safe. Three months following operation she received 800 milligram hours of radium screened with silver and rubber within the mouth, also 25 M A M of x ray were given over nine areas using an 8 inch spark gap with 5 milliamperes, ten months after operation a total of 5400 milligram hours of radiation was delivered, most of it externally at a distance of 3 cm from the skin.

The patient has been able to resume school work and to mingle on a comfortable social basis with children of her age.

#### COMMENT ON GIANT CELL TUMORS OF THE JAWS

The most common tumor of the jaws is a firm, smooth, painless growth which appears at the border of the gum be

tween the teeth. The teeth are to all appearances perfectly sound and the tumor has every clinical aspect of benignancy. The mucous membrane overlying the tumor is smooth and glistening. This is the type of tumor which most frequently carries the term epulis. It is a solid tumor which on microscopic section shows a more or less uniform stroma of connective tissue cells through which are scattered a varying number of giant cells. While its origin is disputed I am inclined to concur in the opinion that it is a granuloma which springs from a tooth root. These tumors do not metastasize but are prone to local recurrence unless thoroughly removed. The method of removal which has proved best in our hands is extraction of the bordering teeth followed by the inclusion of the tumor and neighboring alveolar process in one bite of an extra large rongeur. The entire wound is then cauterized with the actual cautery. While this treatment is followed by a rather prolonged convalescence there is little general disability and the tumors do not recur.

The tumor of the jaws which probably is the most puzzling to the clinician and to the pathologist is the adamantinoma. The patient usually comes with a history somewhat like this. There was a loose tooth usually painless which was extracted by a dentist. The socket did not heal in the usual period of time so it was curetted. The number of times the socket was curetted varies with the intelligence and persistence of the dentist and the patience of the patient. If persisted in long enough other teeth are extracted because they too have become loose. Upon examination we find a raw surfaced tumor mass protruding from the tooth socket or sockets. The surrounding mucous membrane is smooth. Often a general thickening of the alveolar process is evident. An x ray will usually suffice to make the diagnosis certain because of the characteristic bone destruction the margins of the destroyed bone showing a smooth wall. A section submitted to a pathologist for microscopic diagnosis will more often than not obscure the clinical picture because these tumors show the greatest variation in histologic form. Sections from the same tumor have been variously diagnosed by competent pathologists as basal cell carcinoma spindle

cell sarcoma, squamous cell carcinoma, and "epulis" with giant cells. Other tumors of this group show the structure of adenocarcinoma, and may be considered as true carcinomata. As a rule, adamantinomata are slow growing tumors which first make their appearance after the third decade. Their occurrence has been noted in all decades, however, and I have observed one case in a pregnant woman which grew at an alarming rate for the three months preceding its destruction. In character these tumors are locally malignant. They seldom metastasize to lymph glands, but they invade bone and surrounding soft tissue and are prone to local recurrence. The treatment is thorough destruction of all parts of the tumor after its limits have been ascertained, and, if the limits cannot be exposed, radium in large doses is administered.

Besides the above-mentioned giant celled tumors of the jaws which may be considered to be peculiar to the tooth bearing alveolar process, the mandible and the maxilla are not immune to the giant cell tumors which attack other bony structures throughout the body. As they are comparatively rare, however, and their diagnosis and treatment is in no way different from such tumors which appear elsewhere they do not require special comment.

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## CLINIC OF DR FRANCIS REDER

### DEACONESS HOSPITAL

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#### LIPOMA OF RIGHT PECTORAL REGION

WE have for consideration in our clinical material several tumor cases that should prove interesting. A tumor, more commonly called a swelling, is always of interest. The various obstacles usually presented, relative to the correct identification of a tumor, stamps it one of the most engaging conditions for clinical diagnosis. Furthermore, the surgical measures contemplated for the successful removal of a tumor always excite the keenest interest in the surgeon.

The first case to be presented is a man thirty eight years of age, with a swelling in his right pectoral region, immediately below the clavicle, near the acromial extremity. You will notice that the man is in excellent health. He has charge of a railroad yard and has been working daily up to two days ago. The reason he discontinued work was on account of a pain in his right shoulder joint, which he attributed to this tumor mass. He states that whenever he uses his arm he experiences a dull heavy pain as though something was pressing on the shoulder joint. He also tells us that this swelling has been getting larger during the last five weeks. This seemed to him strange, inasmuch as the swelling had been there for many years, retaining the same size and never causing him any discomfort.

On examination we find a well defined swelling, oblong in shape, immediately below the right clavicle. At the acromial extremity the mass dips into the axilla. The overlying skin is not adherent, there is no discoloration visible and the veins, which can be fairly seen, present nothing abnormal. By grasping the tumor at its base with thumb and index finger and making gentle compression the mass is found to be freely movable.

You will also notice that the skin immediately overlying the tumor appears lobulated. The compression does not cause pain. The pain the patient experiences in his shoulder when ever he attempts to use his arm is a pressure pain, caused by the tumor pressing upon a nerve in relation to the brachial plexus.

We have carefully considered the clinical aspects of this case and should have no difficulty from what we have elicited in

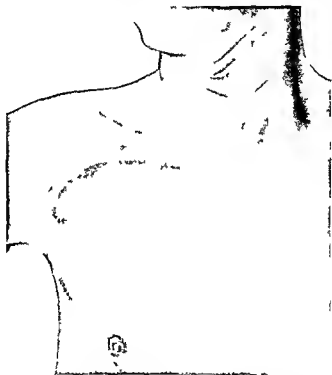


Fig. 463 —Lipoma in subclavicular area of right pectoral region

arriving at a diagnosis. There is every reason to believe that this mass is a subcutaneous fatty tumor, a lipoma.

*Subcutaneous fatty tissue is the favorite seat of a lipoma.* The site, too, is a favorite one for these growths. Other favorite localities are the neck, back, thigh, forearm and the volar side of hand and foot. In fact, any locality where the skin is scantily supplied with glands is a favorite one for a lipoma.

There are two varieties of fatty tumors, namely the circumscribed variety, and the diffuse form. In the circumscribed lipoma the capsule is perfect. This is, indeed, a fortunate circumstance when an operative measure is undertaken, as the capsule is taken as a guide in the enucleation of the tumor. A diffuse lipoma is not encapsulated. The tumor sends into the surrounding loose connective tissue prolongations which sometimes are not discovered during the removal of the tumor and lead to a recurrence of the growth. Fortunately operative treatment in diffuse lipoma is not often indicated, as the tumor usually becomes stationary. Should, however, an operation for the removal of a diffuse lipoma be undertaken rest assured the work will be difficult no matter where the tumor is located. This is in contradistinction to the removal of a subcutaneous lipoma, which is one of the simplest proceedings in surgery.

For the sake of convenience, lipomata are considered according to the situation in which they arise. Although the favorite seat is the subcutaneous fatty tissue, these growths may also be subserous, submucous, subsynovial, intermuscular, periosteal, and meningeal. A fatty tumor may also arise from the sheath of a tendon or from the sheath of a peripheral nerve.

Some of these lipomata, arising from the different structures enumerated are not often met with and on account of their rarity may present great difficulty in reaching a diagnosis. A subserous lipoma of the knee-joint known as a lipoma arborescens is exceedingly difficult to diagnose. Often the diagnosis is only definitely made at operation. Such a tumor disturbs the function of the knee joint, and its removal by arthrectomy is usually indicated. A fatty tumor in the palm of the hand can be readily mistaken for tuberculosis of the tendon sheaths or for a plexiform neuroma.

A rather confusing situation is sometimes encountered with subserous lipomata. I recall a case in which a diagnosis of inguinal hernia had been made. Operation disclosed the mass to be a subperitoneal lipoma. Its removal was difficult. Intra-abdominal lipoma are invariably mistaken for other pathologic conditions. Fatty tumors of the abdominal organs and of the



subperitoneal layer of fat are seldom recognized before the abdomen is opened

The lipoma originating from periosteum may sometimes prove very puzzling as to their true character. The back, usually the lumbar region along the spinous processes is the favorite seat for such a tumor. I well remember my disappointment in connection with a tumor in the lumbar zone. It was a lipoma in this I was quite certain. I however in operating had overlooked the fact that this lipoma differed from the subcutaneous lipoma. In excising the tumor it was simply dissected away from the spinous processes from which it had appeared to originate. Within six months there was a return of the tumor. Of course malignancy, most likely a sarcoma was suspected. A small piece of the tumor was excised for examination. It was returned by the pathologist with the notation non malignant. The true nature of things then dawned on me. I was not thorough enough in removal of the tumor. The periosteum from which the lipoma originated should also have been removed. This was done at the second operation with no recurrence after six years. It must be borne in mind that the periosteal lipoma is usually congenital and unless the excision is complete the tumor will recur. Lipomata arising from the fascia and aponeurosis of muscle must be similarly dealt with: i. e. the basal portion of their origin must be removed to make certain that no recurrence will take place.

A subcutaneous lipoma is of slow growth this characteristic being a great aid in differentiating it from sarcoma. Sometimes however a lipoma remains stationary for a certain length of time when without any apparent provocation it resumes its growth. Such a tumor may grow to a large size. When favorably located it will cause no functional disturbances. It is only when a tumor of this character causes pressure upon a nerve that there is any pain and only when it encroaches upon a joint does it cause discomfort. Such a case is the one under consideration and it is mainly for this reason that the patient is asking for relief.

Before proceeding to the operation let us again reflect to

make certain our diagnosis. Is there any other condition that may present similar characteristics? The recognition of an uncomplicated subcutaneous lipoma should not be difficult. A cystic swelling may simulate such a tumor, however, here the doubt can be readily cleared up with an exploratory puncture. Sometimes inflammatory processes may occur in a lipoma and may complicate matters, especially when the skin over it atrophies and ulcerates from impaired nutrition. A lipoma so complicated might lead the surgeon to suspect a malignant growth. Under such circumstances a careful consideration of the clinical history will prevent a mistake in diagnosis.

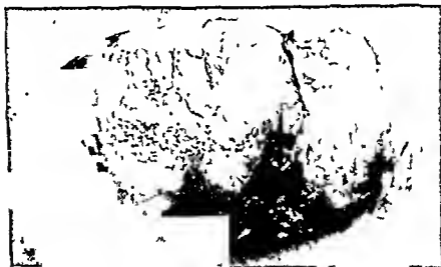


Fig 464 —Tumor after removal (actual size)

As far as the treatment of lipoma is concerned, the only proper procedure is removal by excision. Like in all surgical operations, be they minor or major, the strictest aseptic ritual is adhered to. Even in an easily removable lipoma, the surgeon must not relax his vigilance. In his preparations to procure asepsis, he must be just as careful as for an abdominal operation. The fact must not be lost sight of that an abundance of connective tissue forms the bed of the tumor, which is admirably adapted to diffuse infection.

In this case preference is given to the semilunar incision. It will secure more room than a straight one. After reflection

ful as it demonstrated to us that the aseptic measures which were employed were thorough. It is such an easy matter to get a saprophytic infection of a blood clot whenever a secondary invasion of a clean wound in the process of healing becomes necessary that it is a wonderful relief to obtain healing *per primam*.

## TUMOR OF ABDOMINAL WALL

WE have here a man, a glazier by trade, forty-two years of age, 6 feet, 2 inches tall, and weighing 160 pounds, who states that he has a swelling on the left side of his belly near the navel. About three weeks ago he discovered the swelling, his attention having been drawn to it by a dull pain. The swelling at that time was as large as a pigeon's egg. He does not remember having injured himself. He has had no chills and does not feel feverish. Has always enjoyed good health. Since the discovery of the swelling his appetite has not been so good. Sleep has become somewhat disturbed. Otherwise he feels well. He would continue at work, but is anxious to be relieved of the swelling, which has been getting larger.

Let us examine the patient and see what this "swelling" means. Immediately below and to the left of the navel there is a globular swelling which is hard and well rounded in contour, excepting near the navel, where the contour is broken on account of the firm resistance encountered in those tissues. Here the tumor shows a tongue like projection below the umbilicus, extending toward the median line. The swelling has a transverse diameter of about 2½ inches. Its elevation above the level of the skin is about an inch. The swelling is fixed and there appears to be but little pain when it is being palpated. Intermittent pressure with the index or middle finger does not give a fluctuating sensation or a wave movement. The whole surface area gives a uniform sense of resistance.

There is nothing abnormal about the overlying skin—no edema, no redness. A physical examination finds this man in a fairly good condition, excepting that he is somewhat under weight, which may be a family characteristic. His temperature registers 99.2° F. His pulse rate is 86. The Wassermann reaction of the blood is negative, thus excluding a gummata. There was no microscopic examination of the blood made, so we do not know whether there is an increased leukocyte count or not.

its aponeurosis reaches the margin of the rectus it divides into two lamellæ one of which passes in front of the rectus blending with the aponeurosis of the external oblique the other behind it blending with the aponeurosis of the transversalis and these joining again at the inner border of the rectus are inserted in the linea alba This arrangement of the fascia exists along the upper three-fourths of the muscle As for the lower fourth the aponeurosis of all three muscles passes in front of the rectus without separation

When you notice that this swelling is located above the lower fourth portion of the rectus muscle you will perhaps agree with me that such an aponeurotic investment may influence a swelling in a manner as to make its identity very doubtful One thing is certain if pus is contained within such a firm unyielding wall as this fluctuation could hardly be detected The detection of fluctuation is of the greatest practical importance and though we are at a loss to get it we will not dismiss our diagnosis of abscess entirely

What other pathology is there that would more closely meet the clinical aspect of this condition? A sarcoma? A fascial sarcoma? And why a sarcoma? May I remark here that clinically the sarcoma resembles more closely an inflammatory process than a tumor, and that differential diagnosis can often only be made by resorting to exploratory puncture The history in this case is not clear enough to be of any assistance in making a diagnosis of sarcoma We again keenly miss the factor of trauma The influence of trauma in the production of sarcoma is frequently the exciting cause It is the clinical characteristic of the swelling that presents so much in common with sarcoma

What is a sarcoma? A sarcoma is a connective-tissue growth occurring usually in childhood and adult life, and is malignant It invariably begins in the connective tissue primarily Other tissues are involved secondarily, that is by extension You will remember that the ancients applied the term 'fleshy tumor' to a sarcoma In this case we have a tumor, to all appearances, in the left rectus abdominis muscle

It is one of the favorite sites for a primary sarcoma A

greater preference, however is shown for the muscles of the lower limb. The growth of this tumor, as we can infer from the history was rapid. Its shape is globular and the skin covering it is smooth. There is no pain on gentle pressure. The palpating finger reveals a uniform tension over the whole swelling which imparts the sensation of a soft tumor. The tumor is not movable, which must be attributed to the aponeurotic envelopment, this structure acting as a resisting structure. The tumor appears to be deep seated yet the margins are fairly well defined. Upon close inspection it lends the appearance of a tumor which had infiltrated the adjacent tissues. The general health of the patient does not seem to be impaired. In view of this clinical evidence we are prompted to seriously consider this condition as sarcoma. Should it prove to be such, our hope in giving this patient more than temporary relief is not promising.

In our present limited knowledge no matter what the surgical measure or therapy and when I speak of therapy I have reference to the toxin method and treatment by Roentgen ray and radium, nothing of a permanent cure can be expected. Surgical ingenuity and enterprise have done much in affording relief and it is today the accepted measure for a malignant tumor within the bounds of justifiable surgery.

Inasmuch as this case is somewhat of doubtful diagnosis, we will make an exploratory incision and see what the pathology will disclose. The incision will be made over the convexity of the tumor and parallel with the muscle fibers. If the structures appear suspicious a section will be excised for microscopic examination. We have incised the anterior layer of the aponeurosis and have penetrated into the muscle. The muscle substance has a normal appearance. I wish to emphasize this fact because in sarcomatous disease of the muscle it is not infrequent to find on section that the muscle appears to be replaced by hard tough pale gray material.

We will proceed cautiously, as we are nearing the structures that serve as a covering for the abdominal cavity. Rather than trust to the knife I prefer to proceed with a blunt pointed instrument, according to the method of Hilton. A Carmalt

artery clamp answers admirably. The closed blades are cautiously buried for a short distance in the tissues and the blades gently spread. In this manner the advance is made till the objective is gained. It is a safe procedure in any locality where caution is necessary—it is particularly indicated here. After traversing the muscle in this fashion and finding it healthy we entered a cavity from which dark brown, sour smelling pus escaped thus giving us our diagnosis.

We were more nearly correct with our first impression of the clinical condition than we were after our more thorough analysis. The error in diagnosis was caused by the aponeurotic layer which envelops the rectus abdominis muscle acting as a resistant structure thereby temporarily suppressing nearly all the cardinal signs characteristic of an abscess.

Now all that is left is to enlarge the opening which can safely be done under ocular guidance so that drainage can be free. The wound is cleansed by blowing out the pus with peroxid of hydrogen, wiping it dry and filling the cavity with 1 per cent mercurochrome solution. A loose tamponate completes the toilet.

Let us suppose that we had encountered a sarcoma—what then? I would have felt great hesitancy in excising the greater part of this muscle because the operative measure would have had to be necessarily very extensive.

You know that in all malignant growths the removal should be as early as possible by a thorough excision including with the tumor a wide zone of apparently healthy tissue. This is particularly true in sarcoma. It is absolutely necessary to remove not only the proximal lymphatics a possible route for regional infection but also as much as is possible of the connective tissue in the region of the tumor a tissue through which local and regional infection takes place. You may probably be impressed by the extent of the sacrifice necessary when I state that in sarcoma of the limbs which often involves important vessels and nerves amputation must be performed at a safe distance from the tumor.

Operative recovery in this case would have left this patient

in an awful condition as far as the abdominal support is concerned. He probably would have developed in a comparatively short time a ventral hernia of enormous size, even with the wearing of a good abdominal support. And here again, what promise could we give this man relative to a recurrence? A very vague one indeed, because we know that such tumors, deeply located, return almost without exception after excision. Rather than subject this patient to such an extensive operation with so little promise, I would prefer to trust his condition to the inoculations of the toxins of the *Micrococcus prodigiosus* and the *Streptococcus erysipelatis*, as originated and advocated by Coley, and also to the irradiations of the Roentgen ray or radium. Even though these measures have been disappointing, there have been occasionally results of an encouraging nature. At any event, I feel that they are free from the dread of a surgical operation which may carry great psychic weight with a patient.

#### COMMENT

It would be of the greatest interest to know the etiology of this abscess. The history is of no assistance and the patient discovered the lump accidentally, that is he felt a pain and put his hand where the pain was.

The pus that escaped did not resemble the pus coming from a "cold abscess." The pus was dark, thick, and had a sour odor. In the hope of isolating the organism, Dr. Ives examined some of the pus. He states:

"Smears show numerous leukocytes and Gram-positive cocci and Gram negative bacilli. Culture on blood agar shows in addition to the two organisms mentioned above, a yeast. The yeast corresponds to the mild type. It does not produce mycelium like the known pathogenic yeast organism. In a mixed culture like this it is impossible to state the etiologic factor as one or more of the organisms may be contaminations or secondary invaders."

The wound healed rapidly. Nothing of an unusual nature presented itself.





## INFLAMMATION OF THE PREPATELLAR BURSA

THE patient, a woman fifty two years of age, presents herself with a swelling on both of her knees. The swelling on her left knee, which is quite hard and much smaller than the one on the right, does not cause much inconvenience. It is for the swelling on her right knee which is soft and large, that she seeks relief. This woman earns her living mostly by scrubbing. Her general health she says was good up to three weeks ago when she had to stop work on account of pain in her right knee.

The diagnosis in this case should not present any difficulties and those of you who have seen a similar condition before will find it easy to recognize. We have here a subacute exacerbation of a chronic prepatellar bursitis of the right knee. There is also a prepatellar bursitis of the left knee. It is a chronic condition with no evidence of acute inflammatory disease and, as you have heard the patient say, causes little inconvenience.

Let us examine the swelling on the knees and determine their true nature.

The swelling on the left knee, which does not cause the disability, is immediately over the anterior surface of the patella. The patient tells us it has been there for several years. On inspection no inflammatory signs are present. The only visible evidence is a swelling, somewhat flattened and in size equal to half section of a small lemon. On palpation the bursa imparts the feeling of a dense fibroid mass of almost cartilaginous hardness. Such a bursa, on section, will show concentric layers of dense fibroid tissue. There is usually a small central cavity containing a little fluid.

The condition in its present state is a chronic enlargement of the prepatellar bursa with fibroid thickening of the walls. Should at any time evidence of inflammation show itself the only treatment would be excision.

The swelling on the right knee is the condition causing disability and demands our attention. On inspection there is

noticed a well defined cystic swelling about as large as a lemon, upon the anterior surface of the patella

The skin overlying the tumor is thick and hard. The tumor imparts a marked tenseness and fluctuation is easily obtained. Gentle manipulation causes but little pain. We must not be surprised that this swelling is not more painful. Even in very large prepatellar bursitis there is little pain because there are no important nerve trunks for the tumor to press upon. This patient tells us that she has had a swelling on her knee for



Fig. 466—Hygroma bursæ præpatellaris of right knee. Chronic enlargement of bursa with fibroid thickening of its walls of left knee.

months and that only during the last three weeks did this swelling grow larger. What are we to infer from this? Simply that we are not dealing with an acute inflammation of a bursa but with a chronic bursitis presenting all the signs of a subacute exacerbation—a hygroma.

The acute process in the bursa when it first became diseased months ago, had given way to a chronic course. Three weeks ago some organisms gained entrance, presumably through the

close relationship with the lymphatic system, and set up the present mischief

A chronically enlarged bursa, like other pathologic conditions, shows an abnormal susceptibility to acute inflammatory disease. The contents of this hygroma will most likely be of a thick mucoid character. I come to this conclusion from the tenseness of the tumor and the thick and hardened feel of the skin covering it. Usually the contents of a hygroma consist of a mucous fluid either of thick consistency or more serous.

And now what are we going to do for this woman? We are going to relieve her in the simplest way possible, and that is by two small lateral incisions at the most dependent parts of the tumor as near to the patellar base as is possible, to obtain good drainage. Furthermore, a ribbon of rubber dam will be carried through these incisions and secured by tying the ends together over the top of the swelling to prevent displacement. This is important because the ribbon of rubber dam will not be removed till there is satisfactory evidence that drainage has ceased. In this case it will be in about a week or nine days.

You noticed the character of the contents of the swelling as it escaped through the incisions. It was a thick dark colored mucoid liquid. We can feel reasonably certain that this liquid was not purulent and that its dark color was caused by slight hemorrhages having taken place from the wall of the hygroma. Had the fluid been of a purulent nature, inflammatory conditions would have been more pronounced about the tumor. Such inflammations are very progressive and soon take on a phlegmonous character, causing the pus to burrow into the neighboring cellular tissue.

Notice how the walls of the tumor have collapsed after its contents have drained away. The swelling has almost entirely disappeared. There will be oozing for several days, that is, as long as nature's defenses have not been fully established. Provision must be made for drainage. If you should neglect to do so, the small skin incisions would soon close, thus preventing escape of the fluid which would again accumulate, causing a similar condition, as was originally the case. After the drain

is removed the wound will be dressed with a simple aseptic dressing. In this case we will omit any irrigation of the sac. I am inclined to believe that we would interfere too much with nature's constructive processes.

If this hygroma had been a frank infection an antiseptic irrigation with 1:2000 solution of ichlorid or a 3 per cent solution of carbolic acid or the injection into the sac of tincture of iodin or a 2 per cent mercurochrome might prove efficacious. The better acquainted I have become with pus the more have I become inclined to let the involved structures alone. Be sure however that you have established proper drainage. Rest with an appropriate splint is essential.

Why were the incisions made laterally in this case? Not for any special anatomic reason. An incision can be made in any part of such a tumor because there are no anatomic structures that must be respected. The incisions were placed laterally for purely practical reasons. Knowing that this woman will again resume her work as a scrub woman as soon as she is able it will be to her comfort not to suffer pain when kneeling. Placing the incisions as we did will carry the scar away from any part of the knee that may be subjected to pressure.

Not all cases of hygroma are as easy to deal with as this one. There are chronic enlargements of prepatellar bursæ that require complete excision to effect a cure. The operation presents no special difficulties. It must however be remembered that the prepatellar bursa does not communicate with the knee-joint and that the relations of the deeper portions of the bursa are often very intimately blended with the capsule of the joint. The dissection must be undertaken with the greatest care lest an accidental injury to the joint capsule be inflicted. To gain the best access the curved incision with the convexity upward should be given preference.

*I am inclined to the opinion that the average physician is not as well informed on the chapter of bursæ as he might be. That may be because anatomically they are not interesting. Pathologically they are however very interesting and surgically they are quite important. I know of a bursa from my*

own experience that is anatomically exceedingly interesting, and that is the subdeltoid bursa so brilliantly described by Dr. E. A. Codman.

What is a bursa? A bursa is a sac enclosing a small amount of serous or synovial fluid designed to obviate the ill effects of pressure, to facilitate gliding movements and to diminish friction. They are usually located near joints and over bony prominences.

Structurally, they are composed of a definite capsule consisting of fibrous tissue, lined by a delicate endothelial membrane, not at all dissimilar to the pleura or peritoneum. Very few bursæ communicate with a joint. The prepatellar bursa has no communication with the knee-joint.

The human body is well provided with bursæ. The number of more or less constant bursæ is very great and, if I do not err, something like one thousand have been described. About eighteen are to be found in the parts around the knee-joint alone. There are many locations in the body where bursæ are constantly present. The most prominent of these locations are about the patella, the olecranon, about the shoulder, about the great trochanter, and about the tuberosity of the ischium.

It is a strange fact that a bursa, quite perfect in structure, may be formed in any part of the body exposed to abnormal pressure and friction, particularly over bony prominences; for instance, over the outer malleolus of a tailor, over the spinous processes in kyphosis of the vertebræ, upon the sternum of a shoemaker, under an old corn or over the head of the metacarpal bone of the great toe, familiarly known as a bunion. Some of these bursæ have been termed "accidental" bursæ and some have been called "occupation" or "trade" bursæ. They demonstrate quite clearly that bursæ owe their origin and growth to mechanical causes.

How are these so-called "accidental" bursæ formed? That is an exceedingly interesting piece of work on part of the human economy and I regret that my knowledge is limited on this subject. However, this I will say, that these bursæ originate from the soft connective tissue which lies between two layers of tissue

and which becomes more and more wide meshed. At the outset the space in the tissue is irregular and contains atrophic connective tissue fibers. It however gradually develops into a complete sac with smooth walls and endothelium like any other connective tissue space.

Bursæ like the great serous cavities are in direct communication with the lymphatics and inflammatory products are consequently absorbed from them with great readiness often giving rise locally to a diffuse inflammation of the surrounding cellular tissue closely resembling phlegmonous conditions.

A practical example would be a drop of pus in the small false bursa formed beneath an old corn causing edema and redness to the knee or an adenitis in the inguinal region. Conversely a septic focus such as a furuncle of the leg or forearm may cause mischief in the prepatellar or olecranon bursa.

The exposed position of many bursæ predisposes to injury from comparatively trivial causes. A contusion or a prolonged irritation will often suffice to set up a disturbance. Particularly liable to such an injury is the bursa in front of the knee at the point of the elbow and over the tuberosity of the ischium. So common are these affections with certain vocations that they have become known as housemaid's knee, mimer's elbow and weaver's bottom.

There sometimes occurs a rather strange condition in connection with a chronic enlargement of a bursa that I wish to speak of before dismissing this subject. I have seen but 3 cases, 2 involving the prepatellar bursa and 1 involving the olecranon bursa and they impressed me as unique. All three cases presented a chronic enlargement of the afflicted bursa and harbored the so-called melon seed or rice bodies, the corpora oryzoidea in large numbers, several hundred in each bursal sac. The number of such free bodies in old hygromata may vary greatly, often reaching many hundreds. The bodies are usually smooth of a grayish white color and frequently as large as a coffee bean. They may be oval, flattish, are usually quite symmetric and float freely in the interior of the bursa.

The origin of these melon seed or rice bodies according

to the investigations of Goldmann, Merkel, and Volkmann, is attributed to a fibrinoid degeneration resulting from the detachment of fibrillary or cartilaginous proliferations from the wall of the bursa. These bodies may also result from deposits of fibrin from the thickened contents of the hygroma. The condition is recognized by the peculiar soft crackling feeling perceived on touch, a sensation likened to a bag filled with shot, combined with the ordinary symptoms of an enlarged bursa. These rice bodies are quite often met with in cases of tubercular tenosynovitis and for that reason rice bodies present in an hygroma should be considered strongly suggestive of a tuberculous nature.

The treatment is surgical and similar to that of any chronic inflammation of a bursa. It is, of course, necessary that all rice bodies be removed from the bursal sac. Inasmuch as these bodies float about the interior of the sac many will escape as soon as the bursa is incised, others will have to be washed out by irrigation with the physiologic salt water solution and those that seem more difficult of removal will have to be picked out.





## FIBRO ANGIOMA OF SCALP

THE next case that presents itself is of unusual interest Unusual on account of its rarity and unusual because very little can be promised this young man for the relief of his affliction Surgery can promise something, whether or not that "something" will be accepted is a matter that rests with the patient

This patient has visited many prominent specialists in the hope that something could be done for him So far he has not met with any encouragement He came to us because he had heard of some of the successes we have had with the injection of boiling water This young man is now fourteen years of age He states that as far back as he can recollect there has been something wrong with his scalp on the right side He could feel small lumps on his head Not only did he know of their presence when he felt of them, he could see them when he looked into the mirror They could be plainly seen, as there was no hair to cover them These lumps are not much larger now than they were three years ago There was never any pain in the affected part of the scalp His health has always been good

With the exception of the scalp lesion, the boy is physically in an excellent condition His body is free from blemishes When we look at this boy's scalp what do we see? We see a mass of small tumors covering two thirds of the right side of the scalp The border is well defined and corresponds to the hairline in the frontal and temporal regions The posterior margin extends about 2 inches behind the ear, reaches upward and with a strong convexity crosses over into the left parietal region for about 2 inches, and joins the frontal border about 2 inches to the left of the midline The mass has the appearance of a mussed up skull cap placed carelessly on the right side of the head or if the imaginary sense may be somewhat imposed upon, one could almost imagine that he was looking at the convolutions of a portion of exposed brain

There are some 30 tumors of variable size, some as large as

a bisected golf ball. These tumors are hard and more numerous along the border. The central portion of the mass is less nodular, showing marked undulations. The neoplasm appears to be pericranial. It is slightly movable with the aponeurosis and is covered by a thin hairless epithelium. A grayish white color accents its prominence. You will notice that there are numerous dark blue patches scattered about this tumor mass. Some of these patches are as large as a small hazelnut. They are soft and give a sense of fluctuation. This is strongly in contrast with the hard nodular feel of the growth.

These dark bluish patches are small spaces filled with blood and are of an angiomatic character. It is not unusual to find



Fig. 467.—Fibro-angioma of scalp

an angioma combined with a tumor either benign or malignant. The remaining part of the scalp is in a normal condition and is covered with a healthy growth of hair.

Have we been able to gather sufficient clinical evidence to arrive at a diagnosis? It would appear that we have gleaned from the history and examination that this is a case of fibro-angioma of the scalp.

What are the outstanding clinical characters of this lesion? When we consider the manner in which this tumor mass developed, requiring some eight years to attain its present condition, and that there was never any pain, we have the best possible

evidence that the growth is not malignant. In connection with these characteristics when we interpret the information obtained by palpation,  $\pm e$ , the hardness of the whole mass excepting the angiomatous patches, we have still further assurance that the growth is of a benign nature.

The most important features of a fibroma are the firmer feel, its globular form, its slower growth and the comparatively small size of the tumor. There was a time when the diagnosis of a fibroma was made with comparative ease. The advance made in the study of tumors, however, has shown that the diagnosis of fibrous tumors is often a difficult one frequently requiring a close histologic examination.

Inasmuch as a fibroma is a tumor composed of fibrous connective tissue, a tissue of wide distribution throughout the body, it can be readily seen how such a tumor can arise in almost any part of the economy. The most important sites for a fibroma are the skin and subcutaneous tissue, the nerves, periosteum, bone, the fasciæ and muscle sheaths, submucous tissue, the uterus and ovaries.

For convenience more than any scientific reason, fibromata have been divided into two forms, the hard and the soft. It is the hard form that is more prone to invite diagnostic difficulties. However, to the clinician who has studied tumors in general, the diagnosis of a fibroma, for most examples, should not be difficult.

The scalp is one of the rare locations for a fibroma, yet location is apparently of very little aid in clinically solving the diagnostic problem. The diagnosis is often beset with difficulty, especially in the mixed fibrous tumors, a condition frequently met with, as in fibromyxoma, fibromyoma, fibrosarcoma, fibroneuroma, fibroangioma, and fibrolymphangioma. Under these conditions a histologic analysis can only give assurance of a definite diagnosis.

In the case before us no such complications are apparent except the few small angiomatous tumors that are scattered about the surface of the neoplasm. You will notice that we have called this tumor a fibroangioma. We did this because

the fibrous tissue element was in excess. Had it been the reverse so that the angiomatous lesion would have predominated, we would have called it an angiofibroma.

There is only one other condition that could be considered in differentiating this tumor, and that is a deep seated lipoma. A lipoma however, is an exceedingly rare tumor of the scalp. When these tumors are small and situated beneath the aponeurosis, the diagnosis is difficult, the mass often feeling very hard and adherent. The tough aponeurosis obscures the characteristic lobulation and contour of the tumor, making recognition still more difficult.

In this case I am quite certain we do not err. It is the shape and size of the growth that gives us the conviction that we are dealing with a diffuse fibroma.

What can we offer this young man for relief? My advice would be to let it alone for the present. And why? You will recall from the history that this tumor mass has remained almost stationary for the last five years. It may remain stationary for many more years, we do not know. It is characteristic of this neoplasm to grow to a certain size and then become stationary. You will also recall that this patient has never suffered any pain from the growth. He feels comfortable and is in excellent health.

As for the associated angioma the lesion is an exceedingly minor one and its cure by the injection of boiling water would not influence the neoplasm.

Can such a growth be removed successfully by excision? There are recorded cases where large diffuse fibroma of the scalp have been successfully removed by von Bergmann, Tillmanns, Chipault, Manson and Halstead.

Are there any great dangers connected with the operation? There are and the greatest danger is hemorrhage. This we would most likely encounter to a serious degree in this case, on account of the angiomatous condition present, were we to operate. However, in our present enlightened surgical age, the likelihood of severe hemorrhage should not negative an operation.

The denudation in this case would be enormous. The

exposed pericranium would have to be immediately covered with Thiersch grafts. We would, of course, expect that the grafts would "take," and that healing of the denuded area would be prompt, however, those of you who have had some experience with head injuries involving a partial loss of the scalp will appreciate the difficulties encountered in an endeavor to cover the defect and obtain a satisfactory result. The disappointments may be many and the delay in achieving the object may be great.

I do not think that this case is a suitable one for the pedicle flap operation which was so extensively used during the World War and has been of such great value in restoring facial defects. The surface to be covered is too distant. It would necessitate flaps of an unusual length and this would entail a traumatism of great severity.

No matter from what angle I view this tumor mass I feel that in its present state it is better to let it alone. With this boy in good health, the growth causing no pain and very little inconvenience, I do not think that it would be justifiable surgery to attack this growth in its quiescent state. Should it at any time give evidence of growth, rapid growth, then immediate excision should be advised.



## ANGIOMA OF LEFT TEMPORAL AND MALAR REGIONS

THIS young man, in good health twenty four years of age, presents himself with a soft swelling on the left side of his face. He is anxious to have something done because he said it was getting larger. When ten years of age he remembers a soft swelling bluish in color about as large as a small hazelnut, situated over his left malar bone. It never caused pain and no attention was paid to it.

When we examine this patient's face what do we see? We see a soft bluish swelling, bulging out like a huge boil, involving the greater part of the left temporal and the left malar regions. The swelling also involves the upper left eyelid and greater part of the left cheek. The skin covering this swelling is so thin over several areas that it seems as though it would break. On palpation the whole mass appears very soft, giving the impression of liquid contents. By placing the hand flat upon the tumor and making gentle pressure, almost all of the contents can be forced out with comparative ease. Upon release of the pressure the tumor will refill. Furthermore, you will notice that when the tumor is emptied, the skin assumes almost a normal color. With the filling of the tumor the bluish discoloration returns. There is no pulsation perceptible in this swelling.

What is the diagnosis?

We should not find it difficult to diagnose this condition, it is a *caeruous angioma*.

What is an angioma? An angioma is a tumor composed of abnormally arranged, tortuous, and dilated blood vessels.

Is an aneurysm or a varicose vein an angioma? No. Why? An aneurysm or a varicose vein is a dilatation in a pre-existing blood vessel, whereas an angioma is a dilatation of a vessel the result of a new growth.

What do we mean by new growth? The growth of a normal



blood vessel results from a matrix of angioblasts. It is the intrinsic function of an angioblast to produce new blood vessels.

In the normal state these germs furnish the essential tissue elements until the vessel has reached its normal size and then the process becomes stationary.

With an angioma however it is different. The angioblasts exercise no such limitation and their proliferation results in atypical blood vessels which are not required by the part in which they are produced.



Fig. 468.—Cavernous angioma involving left temporal, left malar and left zygomatic regions. Left upper eyelid is also involved.

Some exceedingly interesting studies have been made relative to the congenital origin of these tumors. I have in mind the very interesting contribution of Mr. John Fraser of Edinburgh. Their method of growth very much resembles the infiltrating growth of the malignant tumors. It too leads to the destruction of the infiltrated tissue.

When certain cells of the angioblasts become vacuolated they proliferate in such a way as to form a syncytium. These vacuoles, which enlarge and proliferate as soon as fluid collects within them, give rise to minute reddish specks, the so-called "blood islands of Pander."

The wall of these primary vessels is composed of protoplasm of the syncytium with nuclei embedded in it here and there. Subsequently the protoplasm becomes differentiated around the nuclei into the flattened cells which compose the walls of the capillaries and which form the lining walls of the arteries and veins. Angiomas are congenital vascular productions due to modifications occurring in the course of embryonal development and the assumption is strong that it is from "rests" of this embryonic tissue that an angioma is developed. It is the new growth which constitutes the essential tumor tissue.

Are there different varieties of these vascular tumors? Yes, these vascular neoplasms may be classified on an anatomic basis as capillary, venous and arterial.

The capillary type is the simple angioma, the mother's mark or 'port wine stain,' the "tache de feu" of the French or the Feuermal of the Germans. The condition is also known as a telangiectasis and is always congenital. They are most frequently located in the superficial layer of the skin. If they show a discoloration of deep purple they are of venous origin and if they show a pink or light red the origin is arterial. It is the most common form of the angiomas and possesses no clinical significance. Exclusive of the unsightly appearance it causes no discomfort.

The venous variety, the cavernous angioma, is less frequent. In many instances it is congenital, often however it originates from the simple type.

These vascular neoplasms develop most frequently in the skin and subcutaneous tissue, are usually lobulated, dark blue in color with a skin covering that is sometimes very delicate. These tumors are made up of variously shaped spaces and sinuses filled with blood, the walls of which are fibrous septa lined with endothelium.

A cavernous angioma has been termed an 'erectile tumor' on account of the analogy in its structure to the spongy tissue characteristic of the cavernous tissue of the penis. Such tumors possess the characteristic in promptly reflecting the temperament of the possessor, excitable influences causing the tumor to swell.

become tense and more deeply discolored. Not infrequently these vascular neoplasms are complicated by a nevus formation some as large as a 25 cent piece situated on top of the tumor. In such cases a cure is made more difficult because the nevus is an exceedingly obstinate lesion to obliterate.

This type of vascular neoplasm seldom causes symptoms; it may however cause much inconvenience when involving the upper eyelid, the lips, or the buccal mucosa of the mouth. Such a vascular tumor is not always the result of dilatation of newly formed blood vessels; it is also the result of a confluence of existing vessels whose walls have given way through attrition and pressure atrophy. These tumors often are of rapid growth. At times there is a stationary period; the usual growth however is gradual and the tendency is to continue to enlarge.

The least frequent of these vascular tumors is the plexiform angioma, the angioma arteriole racemosum of Virchow. It is fortunate that this type of angioma is very infrequent because it is the most serious of all forms.

The scalp, the brow, and the face are favored locations and often one of the characteristics of this type of angioma is a well marked pulsation and bruit. These vascular tumors usually develop from the simple angiomata; they may however also develop from mechanical injuries. The vessels in a plexiform angioma are very tortuous and they may consist of arteries only, or of veins, or of arteries and veins in equal proportions. A plexiform angioma is not free from clinical symptoms; it usually causes dizziness, vertigo, and a dull pain in the head. Such disturbances are not associated with a cavernous angioma.

Two-thirds of all angiomata show themselves above the clavicle. Furthermore two thirds of them are harbored by the feminine sex.

If you will observe the topographic distribution of angiomata you will notice that in the face they closely cover the areas traversed by the branches of the trifacial nerve. Baresprung first called attention to this fact. Thus we have angiomas of the frontal germinal area, angiomas of the superior maxillary germinal area, and angiomas of the inferior maxillary germinal area.

What can be done to disencumber a possessor of an angioma? Can these vascular tumors be successfully dealt with? If so, what are the measures?

You will agree with me that the possessor of a simple angioma will hardly ever be persistent in seeking medical advice, especially if the angioma covers a large area, because it is generally known that nothing can be done for such a condition. Radium is giving promise of gratifying results and sufficient success has already been gained to indicate that it may prove of great value. Fuming nitric acid in the more superficial types has given some satisfactory results. Electrolysis, if the area involved is small, will do some good provided there will be no objection to the scarring.

With cavernous and plexiform angiomas the outlook operatively is more encouraging. The fact must not be overlooked that these vascular tumors are among the most difficult lesions with which the surgeon has to contend. In fact, it has not been so very far in the past that a considerable number of these cases have heretofore been deemed inoperable and have been abandoned to an ever increasing deformity and discomfort, and in some instances to death from hemorrhage.

Of course, the ideal treatment is excision. However, before having recourse to this measure it is well to consider several salient points. One, a point of much importance, is the size and location of the angioma, and the risk of life from hemorrhage. The great danger in attacking cavernous or a plexiform angioma with a scalpel is hemorrhage. Another point, and one that commands recognition, especially when the angioma is located on the face, is the liability to deformity from mutilation and cicatrization.

These two points can be fused into one consideration for the surgeon who contemplates excision of an angioma, namely, that this radical measure is only permissible when the vascular tumor is of limited extent, well circumscribed, and situated in parts which can be sacrificed without danger of great hemorrhage or the loss of important structures.

It must be apparent to you that after seeing this case many

of these tumors are inoperable. It has been repeatedly demonstrated when the attempt at excision had to be abandoned on account of hemorrhage. When excision seemed too hazardous the less serious surgical procedures were resorted to such as ligation of the vessels, peripheral ligation and tissue strangulation by the buried suture, but the results at best have been only palliative and disappointing.

The severity and unsatisfactory results of the surgical measures caused other methods to be promulgated. Efforts were made to destroy the tumor by the injection of alcohol, ferric



Fig. 469.—Edema following the injection of boiling water (second day)

sesquichlorid and hydrogen peroxid, but these agents proved futile and involved too great a danger and were soon abandoned.

By a strange incident Dr. John A. Wyeth of New York happened upon the idea that the injection of boiling water into these vascular tumors would produce the desired result. The correctness of this idea was borne out by experiments. The method was applied to inoperable vascular tumors with very gratifying results. It is the method I have used in a large series of cases and have had but few failures. It will be the character of treatment we will institute in this case.

The injection of boiling water is not altogether free from danger. embolic conditions must be reckoned with and periph

all compression should always be applied when an injection is made. Unless the water is introduced into the tumor at boiling temperature failure will result. For this reason it is well to take all the conveniences that will expedite this measure. A proper syringe with a slip-needle is very essential. The patient must be kept as near to the vessel containing the boiling water as is possible, so that the least amount of time will be consumed in the transference of the boiling water. The operator's hands must be well protected with gloves; a heavy chamoisette glove answers



Fig 470—Same patient six months later. Notice slight scarring in temporal and zygomatic regions. On account of the extremely thin condition of the overlying skin sloughs resulting from the injection were expected. The paramount object in this work is *not to get any sloughs*.

the purpose well. During the injection only the vascular tumor is exposed, the rest of the face being well covered with moist towels to prevent scalding from the escaping hot water. These injections are made preferably without an anesthetic. However, if the patient is very nervous, or is an infant or a child, a light anesthesia should be induced. In making the initial injections it is advisable to enter the needle through the sound skin about  $\frac{1}{8}$  inch from the angioma well into the base of the tumor, thus assuring coagulation of the deeper parent vessels. This is also a wise precaution against the dangers of embolism

The subsequent injections can then be made with greater freedom and continued until the contents of the tumor shows evidence of coagulation

The object of injecting boiling water into a cavernous angioma is to produce a vascular blockade. A successful obliteration can only be accomplished by granular metamorphosis made possible by the coagulation of the blood followed by lymph infiltration and cell regression

Great care must be exercised in injecting the hot water. The tumor must give evidence of thorough coagulation of its contents and this can best be judged by the grayish white discoloration of the overlying skin which evidences itself during the injection. At this point the injection must be discontinued for fear of causing a slough. A slough is a very undesirable complication and must be avoided if possible. In the case before us we will most likely obtain a slough because the skin covering the tumor is exceedingly delicate in a number of places. A slough retards healing and may leave an ugly scar. At any event it interferes with the smooth course of an injected angioma.

I wish to call your attention to the edema that develops in adjacent parts shortly after the injection is made. It is always in proportion to the amount of boiling water injected. This edema is sometimes very extensive and it is not unusual that both eyes may be closed. The condition is an afebrile one and free from any danger. It usually subsides rapidly that is within five days.

A successfully injected angioma shows its greatest retrogression from the second to the third week. If we take an angioma the size of a hen's egg and inject it with 100 c c of boiling water which is the amount usually injected the time necessary for absorption to efface the tumor would extend over a period of ten to twelve weeks. If the injection has been a fortunate one the angioma will be effaced and the skin again restored to normal condition.

## REMARKS

About 150 c c of boiling water were injected into this vascular tumor without an anesthetic

The edema that followed was extensive and closed both eyes. It had entirely subsided by the fifth day.

Two small sloughs occurred, one in the temporal region a little above the supra orbital notch, where the effort was made to obliterate the supra orbital and anterior temporal vessels, and one in the zygomatic region, where we endeavored to occlude the transverse facial and orbital vessels.

Under aseptic care these sloughs healed in about two weeks.

At the end of ten weeks the angioma had disappeared and the soft parts again looked normal.

The scarring resulting from the sloughs was slight.





## CONGENITAL DEFECT OF THE LEFT ALA OF NOSE

THE consideration of the condition of the patient before you will require us to make an excursion into the domain of his fetal life. The boy has been indeed very fortunate to come out of his embryonal struggle as well as he did. He is now twelve years of age and says that his nose always has been as it is now.

Please notice the massive build of the youth. There is nothing defective about his physical make-up except what you see about his nose. His health has always been good. He is now approaching the years when pride in appearance remains no longer dormant, and he asks that his nose be "fixed up."

He has 3 sisters and 2 brothers, and all have good faces. When we look at the boy's face what do we see? We see a very good symmetry and a normal development of the organs except the nose. In that organ we notice almost complete loss of the left ala. The opening is triangular in shape and exposes a healthy looking nostril. The defect corresponds to the site of the outer plate of the lower lateral cartilage.

In looking at the columella nasi we find it normal in appearance. Both nostrils are free from any obstruction. When we examine the nose proper we notice that the root and the dorsum are abnormally broad, flat, and unusually prominent. The skin covering the dorsum and root has the appearance of cicatrization. This cicatritial semblance can be traced along the right border of the root of the nose, vertically upward onto the forehead to the hair line. In passing the finger over this particular region a distinct bony ridge can be felt immediately under the cicatritial skin. This ridge is about  $\frac{1}{8}$  inch in width. There is also a distinct furrow paralleling the ridge to its inner side.

From these findings we can with reasonable assurance infer that there occurred during the first weeks of fetal life a lateral

nasal cleft with vertical fissure which resulted in the condition we now have—a congenital longitudinal cicatrix and a defective left ala nasi. Such clefts usually implicate the lip and palate and are sometimes combined with vertical fissure of the upper and lower eyelid.

This boy has had a very narrow escape from a horrible congenital malformation of his face. The fissure formation and the resulting deformity of the nose arise from the incomplete coalescence of the middle and lateral frontal processes. In the case under consideration union of these processes was



Fig. 471.—Congenital longitudinal cicatrix of lateral nasal cleft with defect on left ala of nose.

undoubtedly delayed and the deformity about the root and dorsum of the nose was the result.

It will be remembered that in fetal life near the end of the second week there are formed the so-called branchial clefts—four deep clefts on each side below the cephalic extremity. With the formation of these branchial clefts there appear the so-called branchial arches. These arches of which there are four have definite places between the clefts. By the coalescence of various processes which grow out from the first arch known as the mandibular arch and from the frontal portion of the skull in the neighborhood of the buccal cleft the face is formed.

The superior maxillary process grows out of the first branchial arch backward and upward from the buccal cleft.

The process that is of the greatest interest to us on account of this case is the frontal process. This process grows down from above between the two superior maxillary processes, and subdivides into a middle process and two lateral ones. The middle frontal process is separated from the lateral one on each side by the nasal furrow, and is again divided into halves by a median fissure.

The cheeks, the lateral portion of the upper lip, the upper jaw, and the two halves of the soft palate are formed from the



Fig 472 —Same patient shown in Fig 471 six weeks after operation

superior maxillary processes which grow upward laterally from the buccal cleft.

The frontal process contains the anlage of the external nose, the ethmoid bone and cartilaginous septum, the lacuna of the upper lip, the intermaxillary bones, and the vomer. If coalescence of the edges of these clefts does not take place, abnormal fissure results; and if the coalescence should from some cause or other be delayed, with an eventual union, congenital cicatrices, with some deformity, similar to the case before us, will result.

What operation is best suited in this case for the building of

an ala? The object is of course to restore as near as possible the natural form to the parts. If this can be done by simple methods, they should receive the preference. After all it is a matter of surgical judgment and surgical judgment in plastic work means nothing more than correct measurements made through visual accuracy.

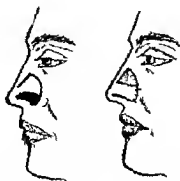


Fig. 473.—Denonville's operation is an appealing one on account of its apparent simplicity. To the inexperienced operator such an impression may lead to keen disappointment. The defect in the ala must be studied very thoroughly when this operation is contemplated because the result like in the A operation will rest entirely with the incisions that shape the flap. It is not unusual that the amount of tissue area outlined by the incision is too small which of course would mean a poor result. The straight incision along the edge of the defect should reach nearly to the inner canthus of the eye whereas the curved incision passing along the nasolabial fold should reach to a point about an inch external to the outer margin of the gap. In dissecting down the flap care should be exercised not to include the facial artery and vein. The loosened flap is slipped downward so that its base becomes the free margin of the new nasal wing. This base is secured by sutures to the lateral margins of the defect which have been previously freshened. The triangular raw area caused by the sliding downward of the flap can be closed by undercutting chiefly on the side of the cheek. If the edges cannot be brought together the raw surface should be covered with Thiersch grafts.

You probably know that there are few good plastic surgeons. This kind of work requires much training, and I know of no training that can be of greater benefit to one who in later years undertakes this work than the drawing lessons taught to the youth during his early school days.

The defect in his ala is not very great; there is, however, enough loss of substance to demand the most earnest consideration in choosing the proper surgical measure. I feel quite certain that with a simple procedure the defect can be satisfactorily overcome. I have in mind an operative measure similar to Nélaton's operation for harelip fissure of the first and second degree.

The measurements must be pretty well fixed in your mind, because only one incision is made and upon that incision the result will depend.



Fig 474 —Dieffenbach's procedure requires a skin flap with pedicle from the cheek. The flap, somewhat oval in shape, is placed over the defect in the ala and sutured in position to the margins which have been previously freshened. In this operation it is imperative that the flap is proportioned to the proper size, otherwise a shrinkage will take place, which may mean deformity and may require correction. To overcome shrinkage of the flap Von Hacker follows the procedure of Dieffenbach, except that he twists the flap so that the epithelium will appear on the inner side of the nostril and the raw surface to the outer side. The raw surface is covered with Thiersch grafts.

At a proper distance from and parallel with the margin of the defective ala an incision is made through the entire thickness of the part that sufficient mobilization may be obtained to permit the loosened border to be placed in the normal position for an ala.

A  $\Lambda$ -shaped incision is thus formed. By drawing down the loosened border the legs of the  $\Lambda$  are straightened and a triangular space is formed which is closed by suturing edge to edge in a manner that will give the desired appearance to the parts. After the operation is finished the suture line will resemble an inverted Y.

In defects, where the loss of substance is extensive, some of the variously designed pedunculated flap operations must be resorted to. The results from these operations are very satisfactory. Sometimes secondary cosmetic operations become necessary, they are, however, of minor consequence when compared with the primary work.



Fig. 475—Von Langenbeck's procedure for the formation of the ala nasi consists of a rectangular flap of skin with the pedicle attached near the root of the nose on the affected side, the flap proper being dissected from the other half of the nose, brought over to cover the defect, and sutured in place. It is an advantage to have a shaving of cartilage incorporated in the lower part of the flap. If this is not possible, the flap should be cut of sufficient length that it can be infolded where the newly constructed border is to be formed, that a thicker and rounder margin may result. A small drainage tube is placed in the newly formed nostril to support it. The raw surface left after taking the flap usually heals by granulation. It is a better plan, however, to cover it with Thiersch grafts. Nélaton's procedure is very similar to Langenbeck's, the difference being that the flap is taken from the cheek of the affected side, and has no cartilaginous support.

It must always be borne in mind that in all pedunculated flap operations a piece of tissue to be of any value in the wall of the nose must have epithelium on both sides. Even with a technically correct flap operation it sometimes happens that the newly built ala is too weak to offer the necessary resistance to the current of air passing into the nostril, causing it to collapse with each inspiration. This is due to the want of a car-



Fig 476 — Von Hacker's operation is a somewhat complicated procedure and is an operation that requires skill and experience. Von Hacker reasoned that an ala to be as near normal as possible must have a skin surface toward the nasal cavity and also a skin covering for its outer surface. To accomplish this he cuts a quadrilateral skin flap from the cheek on the affected side and turns it so that the skin side is toward the inside of the nose. This step in the operation partially closes the defect and gives shape to the ala under construction. The next step is similar to Von Langenbeck's technic, and consists in transplanting a flap of skin from the healthy side of the nose upon the raw area. Secondary cosmetic operations are usually necessary.



Fig 477 — The  $\Lambda$  operation. The incision made through the whole thickness of the nasal tissue with a sharp bistoury, assumes the appearance of an inverted Y after suture. This is the operative technic applied in the case with the congenitally cicatrized lateral nasal cleft with defect in the left ala nasi. The result proved very satisfactory. If the surgeon is reasonably certain of the correct dimensions and the proper placing of his  $\Lambda$  incision, he will find this operation a very satisfactory one. This operative procedure, when suitable, has the advantage over other operative measures in causing less scarring and less humping of the soft parts.



tilaginous support To remedy this weakness a piece of cartilage taken from the ear the *processus caudatus*, for instance and transplanted into the new ala will usually supply the necessary rigidity to the parts

It is needless to impress upon you the fact that these operations must be conducted with the strictest attention to asepsis

#### REMARKS

The A shaped incision was made and answered the purpose well The parts could be easily adjusted to their new positions and sutured without tension

The suture line when finished resembled an inverted Y

The appearance of the newly constructed ala after removal of its border irregularities was very satisfactory

*Sutures were removed on the fifth day Healing was per primam*

The advantage this operation possesses is its simplicity and the small amount of cicatricial contraction

## CLINIC OF DR. ROLAND HILL

ST. LUKE'S HOSPITAL

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### FRACTURE OF THE LARYNX

WE are fortunate today in having a very interesting and rare case of injury—a fracture of the larynx. These fractures are very rare and are attended with a high mortality, which is close to 75 per cent. The infrequency of these lesions is due to three factors: First, the larynx is in a position where it is more or less protected by the chin and chest; second, it is composed of structures that are not easily torn; third, it is movable to a marked degree, and it is this mobility that tends to prevent a serious consequence of traumatism. The common cause of fracture of the larynx is direct violence, but, strange to say, this injury has been known to result from a severe sneeze when the patient's head was turned sharply to one side. By far the most common cause of fracture of the larynx is direct violence. This may be due to a penetrating injury, such as a stab or gunshot, or it may result without any break in the skin. The fracture in the organ may affect the thyroid, the arytenoid or cricoid cartilages, or all. Where both the arytenoid and cricoid cartilages are affected the mortality is close to 100 per cent. The mechanism of these fractures is either lateral compression on both sides, or backward against the vertebral column. The first causes longitudinal fracture of the arytenoid near its middle, with flattening or depression of its side, either with a double lateral fracture of the cricoid or a single fracture in the anterior median line. The second causes irregular multiple lines of fracture. The mucous membrane is often torn and there is frequently extravasation of blood under the skin and muscles. The symptoms of fracture of the larynx depend largely upon

the extent of the injury There is always local pain, tenderness, and swelling There is also interference with speech breathing, and swallowing There may be deformity and emphysema Usually a patient is temporarily unconscious The cough is oftentimes severe and expectoration is often stained with blood Laryngoscopic examination will show extravasation of blood with swelling of the epiglottis

Vitalba<sup>1</sup> has reported a case of sudden death from concussion of the larynx Stimson<sup>2</sup> reports 67 cases of fracture of the larynx and trachea with 54 deaths In analyzing his statistics we find 24 cases all fracture of the arytenoid with 18 deaths There were 11 cases of fracture of the cricoid, with 11 deaths There were 9 cases of the hyoid bone and thyroid, with 3 deaths, and 9 cases of both cricoid and thyroid with 9 deaths Downey Walker,<sup>3</sup> of Glasgow, reports 4 cases of laryngeal fractures One case was that of an engineer, aged forty three, who felt he was about to sneeze He turned his head sharply and sneezed violently This was followed by some pain in the throat and difficulty of swallowing Skiagrams indicated fractures of both cricoid and thyroid In 2 of his cases there were abscesses and in 1 there was marked emphysema Downey Walker regards cases of fracture of the thyroid alone as being much less serious when the cricoid is involved as well Oertel<sup>4</sup> reports 2 cases of fracture of the larynx with recovery In 1 of his cases obstruction was so great that tracheotomy was done This step may be necessary in any case and Keen advises it in all cases where a diagnosis of fracture of the larynx is made D Bryson Delevan<sup>5</sup> reports a case from hanging with rupture of the thyroid This was attended with a recovery The patient was however compelled to wear a trachea tube permanently because of the stenosis of the larynx on account of the fracture having been multiple Sauer<sup>6</sup> of St Louis reports the case of a boy, aged fourteen who had been kicked in the larynx by a horse When first seen six weeks had intervened and the stenosis was so marked that a tracheotomy was done Later, in a few weeks, it was necessary to do a laryngofissure In the anterior of the larynx was a mass of scar tissue The vocal

cords could not be distinguished. Some of the scar was removed and the skin attached to the mucous membrane. The larynx was dilated with O'Dwyer's intubation tubes until all evidence of stenosis had disappeared.

The patient we have here is Louis J. S., aged fifty-one, white, American male, employed as a car inspector at Sparta, Illinois. As you see, he is a well-developed man. He was admitted to St. Luke's Hospital at 8 A. M. on April 19, 1925. His injury occurred the afternoon before while he was raising a car with



Fig 478—Anterior view showing area of emphysema

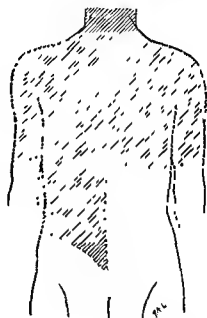


Fig 479—Posterior view showing area of emphysema.

a jack. The handle slipped and flew up and hit him very violently in the larynx. The pain at the time was severe and the shock considerable. When he was admitted to our service the neck was uniformly swollen all the way round. This swelling rapidly extended down the chest, around the back and arms. It crackled under the finger and showed that the condition was one of emphysema. It has gradually extended from the margin of the lower jaw on both sides to the margin of the ribs on the right side and Poupart's ligament on the left side. It extended

down each arm to the elbow. Posteriorly it extended on the left side to the crest of the ilium on the right side it extended to the margin of the ribs. The swelling of the neck has been so great that one could not satisfactorily palpate the larynx. The patient had great difficulty in swallowing for forty-eight hours. The cough was very annoying when blood accumulated but the dyspnea did not seem to demand a tracheotomy. After forty eight hours he began to swallow and his condition has gradually improved since that time. On April 23d a laryngoscopic examination was made by Dr Sauer who reports as follows. The examination of the larynx showed marked swelling over the arytenoid cartilages. There was hemorrhage in the mucous membrane of the larynx. There is a fracture of the larynx but owing to the swelling present it is impossible to determine just what cartilage is involved. The patient has not presented a high temperature any time. The highest four days after the accident was 100.5° F. The pulse never went higher than 100 at any time. Respirations were never more than 24. When admitted the patient walked in. He was much disturbed by cough and expectorated bloody sputum. There was great difficulty in swallowing. Daily notes on this case are as follows. April 20th the patient was unable to swallow ice-bags were applied to the neck and chest glucose and soda solution given by proctoclysis kidneys and bowels act normally. There was marked emphysema in the neck extending rapidly over the chest. April 21st ice pack continued emphysema still spreading patient able to swallow a little junket. April 22d x ray picture taken but result not satisfactory tap water given by proctoclysis. Patient began to swallow a little better ice still continued. April 23d more glucose and soda were given by proctoclysis. Patient is still improving. April 26th patient is able to take food very much better. The emphysema is unchanged there is less cough and the bloody expectoration has disappeared. Since that time he has steadily improved and all that you note today of this examination is that the emphysema still persists but is not nearly so extensive as it was. The patient's voice is very husky. A further laryngoscopic exam

ination was made by Dr. Wood on May 6, 1925. He reports: "That all extravasation of blood and most of the swelling described by Dr. Sauer have disappeared. The vocal cords do not approximate as they should. The anterior four-fifths of the cord come together, but the posterior part does not approximate. This seems to indicate that something interferes with the proper action of the arytenoideus muscle, which pulls the arytenoid cartilages together during phonation, especially of high notes. The arytenoids impress me as having sufficient but improper play, but they seem to slide past each other slightly, the right one going behind and slightly further than the left. They may have been somewhat displaced from their proper articular faucets at the time of the injury. This could easily occur if the cricoid or thyroid cartilage either received more force of the blow than the other."

Our diagnosis of the case is fracture of the arytenoid cartilages, the location of which is not accurately determined. The emphysema has been very slow in disappearing, but at the present time we consider the patient practically well, and he will be discharged in a few days

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## CLINIC OF DR. EDWIN P. LEHMAN

FROM THE DEPARTMENT OF SURGERY, WASHINGTON UNIVERSITY  
SCHOOL OF MEDICINE

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### A CASE OF ACUTE PANCREATITIS; DRAINAGE OF PANCREAS; CHOLECYSTOSTOMY; CHOLECYSTECTOMY

DR. LEHMAN: The patient, who is now being prepared, has had a stormy illness lasting over a period of several years. I have already performed two laparotomies upon her, and she is about to have her third which, I hope, may give her permanent relief. I am presenting her because she illustrates several interesting and important considerations in surgery of the upper abdomen. Mr. B, will you summarize her history.

MR. B: The patient is a white, married woman, twenty-eight years of age, who first entered the St. Louis City Hospital on April 25, 1923. Her family history is unimportant. Her husband and two children are well. She has had one miscarriage. She has always had irregular and painful menstruation, but these symptoms have improved since her first pregnancy. She denies the symptoms of venereal disease. Her only illnesses unrelated to her present complaint have been scarlet fever in childhood and pneumonia at the age of nineteen. Except for slight swelling of her ankles after being on her feet for some time, she is free from symptoms of disease of the heart, lungs, or urinary tract. For several years before her first entrance to the hospital, the patient had had many attacks of what she calls "stomach trouble." These consisted of severe epigastric pain, with vomiting and intervening periods of indigestion. The record does not describe the details of these symptoms more accurately.

DR. LEHMAN: That is a good criticism. What further details would you expect to find recorded?



MR B The duration of the attacks their relation to diet and to constipation or diarrhea the exact meaning of indigestion the character and radiation of the pain the measures used for relief the presence or absence of jaundice observations on the stools a statement on the presence or absence of blood, fresh or changed in the vomitus febrile symptoms during the attack abdominal tenderness during and after an attack

DR LEHMAN The relative weight of history physical examination and radiologic examination in the diagnosis of upper abdominal disease has been the subject of much controversy There is no question that such an accurate history is more valuable in most cases than either of the other two sources of information Unfortunately as we shall develop later this patient was in bad condition when she was first seen and our questioning was limited largely to what information we could gather from her husband What further information have you from the history?

MR B The patient entered the hospital during one of the attacks of pain the most severe she had ever had The onset of this attack occurred about two days previously She suffered from cramping pain in the upper abdomen radiating to the back with repeated vomiting during the first two days This pain was similar to the pain of previous attacks For the three hours immediately preceding the examination the pain had become sharper and agonizing in intensity Vomiting had become almost continuous

DR LEHMAN To summarize the story we have a woman of twenty six years who has suffered from repeated attacks of severe upper abdominal pain culminating in the worst attack of all, in the course of which there is a sharp change in the character of the attack Mr S what common conditions in the abdomen may result in such a history?

MR S Acute appendicitis with spreading peritonitis chronic cholecystitis with an acute attack and possibly gangrene of the gall bladder, gastric or duodenal ulcer with perforation

DR LEHMAN Those are the common intra abdominal con-

ditions Are there conditions not in the abdomen that must be considered?

MR S Spinal cord disease, plumbism, purpura, pneumonia, or other thoracic disease

DR LEHMAN These must always be ruled out in any case of acute abdominal pain On what basis can the differential diagnosis be made?

MR S On the physical examination

DR LEHMAN Yes although certain obvious points in the history must be considered Examination of the chest the spine, the gums the reflexes motor power, and sensory areas, the skin for purpuric spots and finally the blood to inform us of the number and appearance of the white and red cells and the percentage of hemoglobin will serve in most cases With negative results on these examinations we can be fairly sure that we are not confronted by extra abdominal disease Let me impress on you the importance of bearing in mind these four conditions particularly pneumonia There are of course, other rarer conditions that may do duty to confuse the issue I call to mind an acute lymphatic leukemia, with the presenting symptom of abdominal pain We have not yet mentioned the most important examination in the differential diagnosis namely, examination of the abdomen

MR B Examination at the time of the first entrance revealed a well developed and obese woman, lying in bed and suffering from extremely severe pain which was only slightly relieved by flexing the thighs The skin was pale, cold, dripping with sweat There was no jaundice The mucous membranes showed a distinct bluish tinge The temperature by mouth was 97° F The pulse rate was 90 its quality thin and running, the respiration 22 a minute and shallow The white blood count was 19,000 and a catheter specimen of urine was entirely normal The systolic blood pressure was 100 mg of mercury

DR LEHMAN Mr S, what has the physical examination up to this point suggested to you?

MR S The patient was in shock

DR LEHMAN The physical examination gave no evidence of

MR B The duration of the attacks, their relation to diet and to constipation or diarrhea, the exact meaning of "indigestion," the character and radiation of the pain, the measures used for relief, the presence or absence of jaundice, observations on the stools, a statement on the presence or absence of blood, fresh or changed, in the vomitus, febrile symptoms during the attack abdominal tenderness during and after an attack

DR LEHMAN The relative weight of history, physical examination and radiologic examination in the diagnosis of upper abdominal disease has been the subject of much controversy There is no question that such an accurate history is more valuable in most cases than either of the other two sources of information Unfortunately, as we shall develop later, this patient was in bad condition when she was first seen and our questioning was limited largely to what information we could gather from her husband What further information have you from the history?

MR B The patient entered the hospital during one of the attacks of pain the most severe she had ever had The onset of this attack occurred about two days previously She suffered from cramping pain in the upper abdomen, radiating to the back, with repeated vomiting during the first two days This pain was similar to the pain of previous attacks For the three hours immediately preceding the examination the pain had become sharper and agonizing in intensity Vomiting had become almost continuous

DR LEHMAN To summarize the story, we have a woman of twenty six years, who has suffered from repeated attacks of severe upper abdominal pain culminating in the worst attack of all, in the course of which there is a sharp change in the character of the attack Mr S, what common conditions in the abdomen may result in such a history?

MR S Acute appendicitis, with spreading peritonitis chronic cholecystitis with an acute attack and possibly gangrene of the gall bladder, gastric or duodenal ulcer with perforation

DR LEHMAN Those are the common intra abdominal con-

with inflammatory lesions of the gall bladder and liver. The history of previous attacks of upper abdominal pain gives a logical background for the onset of this disease. Would you consider acute pancreatitis as more probable than any one of the three more common possible causes that we mentioned in discussing the history—namely, rupture of a gangrenous appendix, perforation of the gall bladder, or of an ulcer of the gastrointestinal tract?

MR S I do not believe that this is either acute appendicitis or acute gangrenous cholecystitis.

DR LEHMAN Why not acute appendicitis?

MR S Because the previous symptoms have been always in the upper abdomen and symptoms and signs at present are above the umbilicus. Also, because peritonitis from an appendix that has ruptured after forty eight hours of inflammation would hardly be so extensive as to present the desperate picture that has been drawn. The peritonitis would almost certainly be local.

DR LEHMAN What of cholecystitis with gangrene?

MR S Cholecystitis with gangrene rarely causes more than a localized abscess of the peritoneum. However, the previous history is so strongly suggestive of gall bladder disease that it must be kept in mind.

DR LEHMAN The perforation of a gastric or intestinal ulcer with a spreading peritonitis is the most probable of the three. In my preoperative consideration of this case I was misled by the statistical fallacy, namely, the greater probability on numerical grounds. My preoperative diagnoses were (1) Perforation of an ulcer of the gastrointestinal tract (2) Gangrene of a high appendix with spreading peritonitis (3) Gangrene of the gall bladder, with spreading peritonitis (4) Acute pancreatitis. Mesenteric thrombosis was not considered. It is easy on looking back to see that the picture corresponds exactly to the picture of acute pancreatitis, which, in fact, operation disclosed. A typical history of cholecystitis, with probable cholelithiasis, on which is superimposed an abdominal disaster of the first rank—excruciating pain, shock, cyanosis, evidences of perit-

oneal irritation, the abdominal signs localizing in the epigastrium. What is the pathology of acute pancreatitis?

MR. B. A sudden necrosis of the pancreas due to injection of bile into its ducts from a blocked papilla of Vater.

DR. LEHMAN. Will you draw a diagram indicating the anatomic situation? (Fig. 480). Now what further pathologic changes are found?



Fig. 480.—Diagram illustrating the anatomic conditions under which acute pancreatitis may arise from injection of bile into the duct of Wirsung. A calculus impacted at *a* converts the common duct and the duct of Wirsung into a single channel. The course of the bile is shown by the arrow.

MR. B. The necrotic pancreas permits the escape of ferments into the peritoneal cavity, resulting in splitting of intra-abdominal fats into glycerin and fatty acids—so called fat necrosis. The intraperitoneal escape of pancreatic juice and bile results in shock and finally, acute peritonitis.

DR. LEHMAN. You have given the usual student description of this disease based probably on Opie's classical experiment

of injecting bile into the dog's pancreatic duct. As a matter of fact, this description fits only the extreme type of acute hemorrhagic pancreatitis. The pancreas is subject to acute inflammation—i. e., cellulitis—just as the subcutaneous or other tissues are. The infective process may localize to produce the rare pancreatic abscess, or it may become a general cellulitis, involving the whole gland. The virulence of the organism and the rapidity of action of the ferments from the gland govern the rate of progress of this cellulitis. Local resistance, dependent, perhaps partly on the amount of damage from backed up bile, may overcome the acute infection. Or the process may advance so rapidly as in a few hours to cause complete necrosis of the gland with accompanying damage to the contained blood vessels and a resulting extensive intra-pancreatic hemorrhage. Between these extremes are all grades of severity of the process. In the slighter grades where necrosis is limited to scattered cells pancreatic ferments probably do not reach the peritoneum. In the severer grades including complete necrosis of the gland, certain amounts of ferment reach the peritoneum with corresponding degrees of fat necrosis and peritonitis. We must therefore, consider acute pancreatitis as a disease of varying severity with, therefore a varying prognosis. Only in the hemorrhagic form is the outlook absolutely bad.

This description of the disease is a modern conception. The first classification that of Fitz 1889<sup>1</sup> divided acute pancreatitis into three separate forms—namely, hemorrhagic, gangrenous, and suppurative—a classification that Opie accepted.<sup>2</sup> Close association of the first two groups was recognized, but the third was held to be of different character. Suppurative pancreatitis was acknowledged to be infective in origin. The etiology of hemorrhagic and gangrenous pancreatitis was supposed to be chemical, that is, a digestion of the pancreas by freeing and activation of its ferments. Absence of inflammatory cells in the necrotic gland upheld this view. As I have said, all three are probably varying grades of the same process, a combined process of infection and chemical digestion. It seems probable that

both factors must be present. If necrosis is the dominant factor, it may occur so rapidly that the subsequent processes of inflammation are outstripped except at the margins of the necrotic area.

What initiates this process is still an unsettled question. Opie's observations already referred to, namely, the escape of bile into the pancreatic ducts by a block at the papilla of Vater has been accepted as the etiology in a proportion of cases. There are several good reasons to support it, namely: (1) The observation that such an anatomic situation can be demonstrated in a certain proportion of cases of acute pancreatitis. (2) The fact that hemorrhagic necrosis of the pancreas can be experimentally produced by injecting bile into the pancreatic duct in the dog. (3) The fact that, in those cases in which cholelithiasis and acute pancreatitis coexist, the gall stones are usually of proportions calculated to block the opening of the papilla of Vater and yet not to fill completely the lower end of the common duct. Against this explanation three facts may be adduced: (1) The conversion of the common duct and the duct of Wirsung into a single channel cannot be demonstrated in all cases of the disease. (2) An anatomic relationship of these ducts such that conversion into a single channel can occur is observed in only a small proportion of individuals. Judd<sup>3</sup> places the figure at 4.5 per cent. In other words, Mr. B's diagram represents an anomaly with about a 5 per cent incidence. (3) Experimental pancreatic necrosis by injection of bile is made by syringe at pressures never reached in the common duct.

Moynihan<sup>4</sup> in a recent excellent summary of the subject is inclined to feel that invasion of the pancreatic ducts by injected bile is the most logical explanation of the etiology. If this is so, then it is evident that only 1 individual out of 20 is a possible victim of the disease.

Whatever our preoperative diagnosis, there was no question that the case was an acute abdominal emergency requiring immediate exploration. With the preponderance of possibilities on the right side of the abdomen, our choice of incision fell in the upper right rectus muscle.

Under nitrous oxid oxygen anesthesia the abdomen was opened, with the escape of a small amount of slightly cloudy, straw colored fluid. The peritoneum was everywhere injected. There were localized patches of edema in the gastrocolic omentum. In the fat of the mesenteries and omenta there were scattered white flakes 2 or 3 mm in diameter, most profuse at the root of the mesentery of the small intestine—typical areas of fat necrosis. There were no masses in the appendix region or in the duodenum or stomach. There were marked old adhesions about the proximal portion of the gall bladder and the duodenum completely blocking the foramen of Winslow. The dome of the gall bladder was blue and very tense. Palpation of the pancreas revealed an interesting finding. The gland, instead of conforming to the forward arch of the vertebral bodies, lay straight across them, projecting on each side as though erected. It was rigid and stony hard. An incision was made in the gastrohepatic omentum and the pancreas was exposed. It was rounded, and the vessels were engorged. An incision was made in the capsule, allowing the escape of a little cloudy fluid. No necrotic tissue or hemorrhage was seen.

It is, of course obvious that an attempt should then have been made to decompress the biliary system by cholecystostomy to prevent further backing up of bile into the pancreas if that were indeed the etiology in this case. The anesthetist, however, warned us of impending collapse. The abdomen was therefore rapidly closed with mass sutures of silkworm gut leaving a rubber tube and a gauze pack in the lesser peritoneal cavity.

*Bacillus coli* was cultivated from the peritoneal fluid.

The postoperative period was stormy for three days, during which the patient's condition was grave. She vomited occasionally and had troublesome tympanites. The pulse averaged 130. On the fourth day the pulse began to fall and she entered a period of normal convalescence. On the fourteenth day her pulse was 85 and her temperature normal. The wound was draining gray slimy material with a sweet odor. There was no irritation of the skin or apparent digestion of the parietes. On the fifteenth day she developed febrile symptoms. An inter-



both factors must be present. If necrosis is the dominant factor, it may occur so rapidly that the subsequent processes of inflammation are outstripped except at the margins of the necrotic area.

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pancreas and diabetes mellitus is obscure. Although there was no sugar in the urine at any time, I considered that a sugar-tolerance test might prove interesting. The patient, whose estimated weight was 180 pounds, was therefore given 100 grams of glucose by mouth and the blood sugar curve was recorded. This was done on May 31st, thirty six days after the onset of

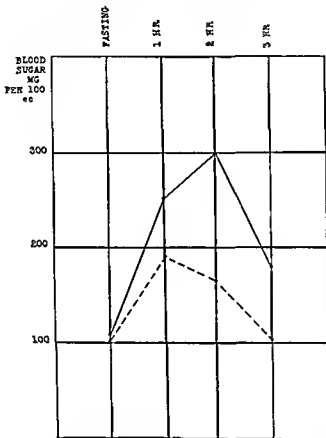


Fig 481 —Sugar tolerance curves ——— Curve taken May 31, 1923, thirty six days after onset of acute pancreatitis  
 ----- Curve taken October 25 1924

acute pancreatitis and drainage of the pancreas and nineteen days after opening the gall bladder. The result, as shown in the accompanying chart (Fig 481), is a curve on the borderline of that given in true diabetes. (*Later note* Comparison of this curve with one obtained seventeen months later and illustrated on the same chart is interesting.)

What advice, Mr S, would you have given the patient at this time?

MR S First, removal of the gall bladder at the earliest possible time Second, close observation of urine and blood sugar for the development of diabetes

DR LEHMAN That is just the advice that was given her In fact, her condition had so improved that I strongly advised her to remain in the hospital a few days longer, with a view to the radical operation She refused this advice and as a result, has lived through over a year of invalidism She further failed to attend a diabetic clinic as we advised

During the interval between June 7, 1923, when she left the hospital, and September 26, 1924 she was seen in three or four mild acute attacks, and on each occasion was urged to submit to operation At no time was there jaundice or glycosuria Mr B, will you tell us the present condition?

MR B The patient was aroused from sleep five days ago (September 26, 1924) by a sharp cutting pain in the right upper quadrant, radiating to the right flank and shoulder She vomited and the pain so increased in intensity that she sought the hospital General examination was negative The temperature was 99° F, pulse 88, respirations 24 and white cell count 11,600 The urine contained no sugar and was otherwise negative There was no jaundice The abdomen was full and was moving with respiration There was no pattern The scar was slightly hypertrophic, there was no hernia Tenderness could be elicited in the right abdomen in both the gall bladder and appendix areas There was no rigidity

DR LEHMAN What is the diagnosis?

MR B Acute cholecystitis Possibly gall stone colic

DR LEHMAN Our diagnosis has been made for us by previous events Do you advise immediate operation or observation?

MR B The majority of acute inflammatory attacks of the gall bladder subside spontaneously if proper medical treatment is given With the patient in the hospital, where hourly observation is possible, I should advise waiting to see whether or not this improvement will take place

DR LEHMAN Why not operate at once?

MR B Because the mortality of operation in the acute stage is greater than that in the chronic stage, and because one might be forced again to do a simple cholecystostomy rather than to complete the operation

DR LEHMAN What is proper medical treatment?

MR B Rest in bed, fluids by rectum and under the skin. If the attack is not so severe as to cause vomiting and if there is no sign of peritoneal inflammation fluids should also be forced by mouth. No cathartics and no morphin should be used. Enemata should be given when necessary.

DR LEHMAN Frequently in these conditions if the pain is from a stone in the ducts, morphin becomes necessary. But in that type of case the danger of masking the symptoms of spreading peritonitis is slight. The patient, of course, should have frequent leukocyte counts and an accurate record of pulse and temperature.

The course advised by Mr B has been taken. During the past five days the symptoms have markedly improved. She is still running a highest daily temperature of about  $99.4^{\circ} F$ , but the abdominal tenderness is almost gone.

We are now about to attempt a cholecystectomy. As you see, the old scar is narrow, and there is no bulging as the patient strains a little. I am employing ether anesthesia, as I want leisure to work, complete relaxation, and freedom from anesthetic worries. Furthermore, I shall probably be working among vascular adhesions, and it is, therefore, essential to avoid the marked venous bleeding that is associated with nitrous-oxid anesthesia.

I excise the old scar. This takes a little more time than a fresh incision, but is a safeguard against the development of a hernia. I dissect out the scar to sound tissue on each side and thereby develop the normal layers. When I am ready to close the abdomen I shall have a single wound whose surfaces are composed of normal tissue.

I am attempting to enter the peritoneum toward the medial side of the incision. I must work with excessive care here, as

It seems wise, therefore, to continue with the removal of the gall bladder so long as active bleeding is controlled. Possibly, when the removal of the gall bladder gives us more room and the smaller vessels have become thrombosed we can more readily identify and ligate the artery. It now becomes clear that the gall bladder has been sharply angulated on itself by an adhesion to the posterior parietes (Fig 482). The middle portion of the gall bladder is thus perhaps an inch less superficial than the common duct. I am working you can see in a deep hole. There is no possibility of rendering the structures more superficial until this adhesion is divided. There is no bleeding as I carefully separate it. At once the gall bladder can be drawn out of the wound, and at once our inability to identify the cystic duct becomes clear. The structure which we took for the common duct is in fact, the adherent common and cystic ducts which run parallel for about an inch. I can feel a stone in the lower end of the cystic duct. A little more dissection in this region enables me to identify clearly the junction of cystic and common duct to ligate the former and amputate the gall bladder. The anesthetist warned me some ten minutes ago that the patient was beginning to show the effect of the prolonged dissection and the loss of blood. The pulse has now risen to 130. As you see, we have started subcutaneous infusion of saline. A hurried palpation of the common duct reveals no calculi. It is not wise to expose the pancreas or the appendix. We must now face the bleeding point that we have buried. The rest of the field is dry. Pressure is removed from the pack without the recurrence of bleeding. Thrombosis of the artery must have occurred while it was controlled by pressure. We might easily dislodge the thrombus in an attempt to remove the pack. I am therefore, satisfied to leave the pack in position. A rubber dam drain is placed so as to separate the gauze pack from the viscera. I close the peritoneum and posterior rectus sheath with No 1 plain catgut, place three silkworm gut stay sutures under the muscle, and unite the anterior rectus fascia with interrupted mattress sutures of No 2 chromicized catgut. The skin receives a running suture of silk.

The patient, you see, is not in the best condition. The pulse is 150 and of fair quality. The skin is pale and wet, but it is warm and there is no cyanosis. The systolic blood pressure is 110. The respiration is irregular, but not shallow. If there is no further bleeding, I expect her to react satisfactorily. She has received 1500 c c of normal saline, about half of which has been absorbed.

Her postoperative orders will include morphin in quantities sufficient to ensure rest, nothing by mouth for at least twenty-four hours, and large quantities of fluid by rectum and under the skin. A blood transfusion will be given if she shows further signs of shock.

On opening the gall bladder we find it contains several soft stones and no bile. The wall consists of  $\frac{1}{2}$  inch of scar tissue.

I have discussed this operation in some detail in order to emphasize one important point in gall bladder surgery, namely, the influence of the time element on the operative prognosis. When we first advised cholecystectomy the operation could have been done with comparative ease and extremely little risk. After a year of repeated inflammatory attacks, the patient as you see, is in serious danger. In fact she was not far from death on the operating table. The operation was bloody, prolonged, difficult, and resulted in considerable damage to the liver. In this clinic we have come to the conclusion that, given a diseased gall bladder, the time for operation is at the earliest possible moment although not, of course in the acute stage. This case brings out strikingly the grounds for that conclusion. A further obvious reason is found in the ill health to which the patient has subjected herself during the period of delay.

*Later Note*—The patient reacted satisfactorily and recovered without complications. The gauze pack was removed under gas anesthesia on the fifteenth day, without bleeding. She was discharged on the twenty-seventh day, with the wound practically healed. The sugar tolerance test repeated on October 25, 1924, showed a normal curve in comparison with the suggestive diabetic curve of the earlier test. One can imagine that the subsiding inflammatory reaction of the pancreas at the

time of the earlier test had somewhat compromised the islands of Langerhans. From the later test it is probable that slight or no permanent scarring of the islands has occurred.

In March, 1925 the patient reported excellent general health with no attacks of pain and with no indigestion.

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## CLINIC OF DR. EDGAR F. SCHMITZ

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### BLADDER FISTULÆ IN GYNECOLOGY AND OBSTETRICS

IN taking up with you the subject of fistulæ of the female bladder I shall endeavor to discuss briefly their etiology and prevention, stress the important points in examination, and outline in some detail the treatment. It may also prove helpful to reiterate and emphasize those very necessary steps in operative technic which will augment successful results and minimize failures, and point out differences of opinion as to modes of procedure in an admittedly difficult and tedious surgical problem.

To illustrate the points under consideration I have chosen 6 cases for demonstration which represent the various types of fistulæ encountered, and shall base my remarks on the experience gained, the difficulties overcome, and the treatment followed in their successful closure.

The cases comprise the following types of fistulæ: (1) Vesico-uterine, following septic abortion with violent curettage. (2) Vesicovaginal, following forceful delivery, large opening involving entire base of bladder. (3) Vesicovaginal, following total hysterectomy, small opening, very high in the left lateral vaginal wall. (4) Vesicovaginal, following total hysterectomy, moderate sized opening, high in central portion of vaginal vault. (5) Vesicovaginal, following forceps delivery, opening under pubic arch on left side near the symphysis. (6) Vesicocervical, following instrumental delivery, craniotomy for a hydrocephalic child.

The etiology of vesical fistulæ is almost covered by the recital of the causative factors in the list of cases just given. It will be seen that trauma of one kind or another is usually the



basis for the development of this most distressing condition. However one causative factor remains which shall only be mentioned in passing for the closing of these fistulæ is dependent upon a condition which is far removed from our present discussion. I refer to malignancy in any form which has destroyed bladder tissue. Here the problem is one of cancer the vesical defect being only of secondary importance.

To return to the etiology of the vast majority of vesical fistulæ one can roughly divide the cases into two groups (1) Direct trauma as that caused by the cutting or punching of a hole into the bladder in the course of some operative procedure or (2) pressure necrosis due to prolonged compression of the bladder wall found most frequently in obstetric cases where the presenting part has been arrested in its descent for considerable periods of time. Under these conditions the bladder becomes firmly clamped between the child's head and the symphysis pubis causing a devitalization of an area of vesical tissue which later undergoes necrosis sloughs away and leaves a permanent defect.

It is hardly necessary to comment on the possibilities of avoiding bladder injury by perforation with a cutting instrument. Better trained surgeons and a disposition to proceed with care where the field of operation is not clearly defined will obviate practically all of these unfortunate accidents. Should a hole inadvertently be made in the vesical wall an immediate painstaking repair will almost certainly close the defect.

The prevention of fistulæ formation due to pressure necrosis is a trifle more complicated for here we are at times confronted with pathologic conditions in labor requiring considerable judgment and special obstetric skill.

It would obviously be impossible to give a dissertation on obstetrics here but if one or two simple facts are remembered much injury to bladder tissue may be avoided and the formation of a fistulous tract entirely prevented. First keep the bladder as nearly empty as possible during labor and never undertake any operative delivery until a catheter has been passed. See that labor is progressive and moderately rapid.

after the head has become firmly fixed in the pelvis. To allow the presenting part to be wedged for hours in the bony ring, with no appreciable onward movement, is to court disaster from possible bladder injury. If any operative procedure must be undertaken, a thorough understanding of the mechanism of the delivery is essential, and gentleness of manipulation becomes of paramount importance.

The significance of the various points which I have so briefly discussed will become apparent on examination of the case histories which will be presented later.

Certain points in the preparation of any case of vesical fistula are so axiomatic that they need not be elaborated upon here. Suffice it to say that all ulcerated areas in the genital canal must of necessity be healed before any operative procedure is resorted to, that calcareous deposits be removed as nearly as possible, and that infection in the bladder be reduced to a minimum.

The examination of the fistulous tract from below is the next step to be considered. This is not always as easy as it may at first seem. To accurately locate the defect is simple where the fistula is large or low in the vagina, but where the opening is small, high, and tortuous, considerable difficulty may be encountered. In these cases it is best to at once inject some dye-stuff into the bladder, and directly observe where the colored fluid enters the vaginal canal. Having established the position of the exit of the tract, it is now incumbent upon us to determine its intravesical location.

That an adequate cystoscopic examination is essential to an understanding of the problem in hand is a truism which cannot be too strongly emphasized. Unfortunately, this is often fought with great difficulty, due to the inability to properly distend the bladder with fluid and thus get a clear picture. The ingenuity of the examiner must here manifest itself, for it is important to view the interior of the bladder for the following purposes: (1) To definitely locate the intravesical end of the fistulous tract; (2) to get an adequate idea of its size; (3) to find its relationship to one or both ureteral openings; (4) to see whether the

ureters are functioning properly or not and (5) to note and consider any other existing pathology

If possible catheters should be passed to determine the patency of the ureters and this failing a dye stuff should be injected intravenously and the expulsion of the colored urine into the bladder noted through the cystoscope

Only after this course of maneuvers has been completed can one understand the problem of a proper closure, and come to some conclusion as to the mode of procedure to follow for one cannot operate intelligently without knowing in advance the exact extent of the bladder injury

Having established the diagnosis the problem which next confronts us is the mode of attack. In very tiny openings which are rare simple sparking with a high frequency current may bring about the desired result but this class of cases is hardly to be considered here and it is mentioned only in passing as it may at times prove useful

The best mode of approach in attacking certain types of bladder fistulæ is an important problem which must be carefully studied before any operative procedure is resorted to as a mistake here may not only unnecessarily prolong the operation but may even lead to a failure in closure

There can be little difference of opinion as to the choice of the vaginal route as a means of dealing with those fistulæ situated low in the genital tract but there is a decided difference of opinion as to whether those fistulæ which are located high in the bladder especially those opening into the cervix or uterine cavity or into the upper lateral vaginal fornices should be approached from below or transperitoneally through the abdomen

No doubt the individual proclivity of the operator must be taken into account in formulating a decision as to how he will approach his problem. However it seems rather illogic and unnecessarily hazardous except under certain conditions to open the abdomen and expose the peritoneal cavity and its contents to traumatism and the risk of infection when in the vast majority of cases the defect can be successfully closed through the vagina

Admittedly, there are conditions which preclude a closure from below, but these belong to the very rare type of vesical fistulæ, and every effort should be made to attack our problem from the vaginal route, as this gives the patient her best chance for recovery, although often, technically, more difficult for the operator.

In any operation undertaken from below one encounters the difficulties inherent in the arrangement of the structures which form the genital tract and pelvic floor. The fistulous opening if high is not readily accessible, and the narrow limits of the vagina make manipulation tedious and complicated. It was therefore suggested by Schuckhardt that a paravaginal incision be made laying open a wide area in the pelvic floor, and thus simplifying the various maneuvers necessary to a proper closure.

That this incision is at times necessary is no doubt true and that it makes more accessible the higher structures is also a fact. But it adds an additional complication to an already complicated problem, and can be dispensed with in the majority of cases even in those which at first seem to be ideal for its application.

Should the closure of the fistula not be successful or only a partial closure result a thing which frequently happens we have added to the patient's woes by having a large incision in the lateral pelvic wall which is certain to become infected, due to the constant bathing with contaminated urine and vaginal secretion.

It is therefore suggested that a Schuckhardt paravaginal incision only be resorted to after a most thorough trial at mobilization of the fistulous area has been made and never as a primary step in the operation, except under the most unusual circumstances.

The secret of success in the closure of vesicovaginal fistulæ is undoubtedly dependent upon many factors but the one outstanding contribution which experience has stamped upon this procedure is the free and complete mobilization of the bladder. To attempt a closure of a fistulous tract with the slightest tension on the suture line, because of inadequate preliminary dis-

section is to court disaster from the outset. There must be sufficient bladder wall available at all times to allow not only a closure of the opening but also to permit of the placing of one or two rows of reinforcing sutures without causing a pull on the vesical wall.

To accomplish this necessitates a thorough understanding of the problem in hand and a willingness to dissect freely in all directions separating the bladder from the uterus and adjacent structures where demanded and even at times opening the peritoneal cavity from below. Only by carrying out a well planned and systematic dissection in this manner can sufficient vesical wall be mobilized to close the larger or more inaccessible fistulæ.

The selection of proper suture material for the closure of a vesicovaginal fistula has always provided ample topic for discussion based largely on the previous training and experience of the individual operator. Good results and failures have been recorded with both absorbable and non absorbable material by men of undoubted ability. It would seem therefore that little is to be gained by broaching this subject here. However a personal preference for the absorbable type of suture prompts me to add my experience with a gut which has given complete satisfaction in my hands.

In searching about for a suture which would resist disintegration for a longer period of time than the ordinary chromic variety I selected material which is used largely by surgeons in gastro intestinal work, namely the extra hard gut known by the pseudonym of Dulox. If the claims of the manufacturer are true that this suture resists digestion to a greater degree than other gut and that because of its hardness it does not readily permit secretion to enter the strand then it should be an ideal suture for vesical fistulæ. In the cases here reported it was used and proved satisfactory.

If it is important to have no strain on the suture line due to improper mobilization of the tissues it is equally important to eliminate tension on the stitches by pull exerted on the bladder wall, due to distention of the organ with urine. A retention

catheter is a necessary adjunct to the operation proper, and should *not* be of the mushroom variety. This type of catheter easily accumulates incrustations and deposits in its bulbous end and when removed may exert an undue harmful pull on the bladder wall. It is far better to use an ordinary rubber tube which can be secured in position by a suture passed through the soft parts and which permits of easy removal and cleansing. Bladder drainage should be continuous over a period of at least a week or, preferably, longer in the larger fistulæ where long suture lines are necessary, and must be carefully observed by a competent nurse at all times, for the backing up of urine may prove the undoing of an otherwise perfect closure.

One other point suggests itself in the postoperative treatment of vesical fistulæ and that is posture. As most of the defects are in the trigon or posterior bladder wall, the prone position is of the greatest help in keeping urine away from the line of suture. By insisting that the patient lie on her abdomen for several days as long as she can stand it the chances for uninterrupted healing are greatly augmented. Should the fistula be anterior as in one of my cases, the opposite position must then be maintained.

The following 6 cases which I will now present will elucidate some of the points which I have so briefly tried to indicate.

Case I—The patient, a young woman in her early twenties was referred to me with the following history. One year previous to my seeing her a criminal abortion had been attempted by instrumental dilatation of the cervix. Following this fever developed and the abortionist, feeling that all of the product of conception had not been removed, curetted the uterus violently. The infection now became severe and on the day following the curetment urine began to dribble from the vagina. This leaking continued throughout her convalescence, which was stormy and protracted, and was *not* checked until the bladder was successfully closed by operation.

The patient stated that posture seemed to have little influence on the amount of urine which drained away, as she was equally

wet and uncomfortable in any position which she might assume. However, she was always able to pass some urine through the urethra which led me to believe that the injury was high in the bladder and this it proved to be.

Vaginal examination revealed the following picture (Fig 483). The cervix was split in the midline up to the anterior vaginal fornix but no fistulous opening could be seen. When a colored fluid was injected into the bladder through the urethra

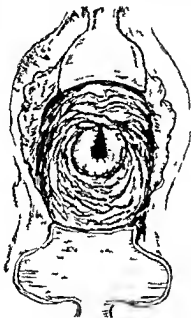


Fig 483—Case 1. Cleft in the vaginal portion of the cervix extending up to the anterior fornix.

a steady stream of the stained urine could be observed passing down through the cleft cervical lip.

Cystoscopic examination confirmed the vaginal findings. An opening about the diameter of a lead pencil could be plainly seen in the midline about 2 cm above the level of the ureteral orifices. Both ureters were intact and functioning normally and the trigon proper was not involved. Immediately behind the bladder defect a marked depression in the vesical wall could be seen about

$\frac{1}{2}$  cm. in width, which, however, had a solid floor. At the time I was unable to account for this depressed area, but subsequent findings at the operation made the picture perfectly clear (Fig. 484).

A diagnosis of vesico-uterine fistula was made, and the patient being in good physical condition, the vaginal walls free

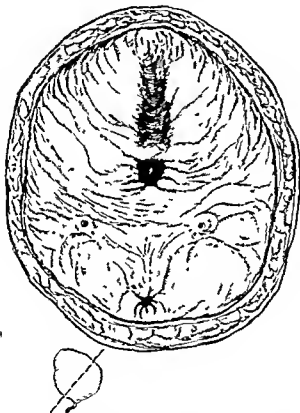


Fig 484—Case I Cystoscopic picture showing fistula with depressed area above opening

from any marked inflammatory changes, an operation was advised at once.

Although the patient had never borne a child at term, and despite the fact that the vagina seemed fairly narrow, I decided to attack the fistula from below. No Schuchhardt incision was made, exposure being secured by narrow-bladed retractors. After the cervix had been pulled down, the incision and dis-



section was carried out in much the same fashion as though an extensive cystocele operation was being performed. The bladder was pushed off of the split cervix working gradually upward toward where the fistulous opening was known to be.

It soon developed that I was encountering a complicating factor for as I proceeded with the dissection and more completely separated the bladder from the underlying tissue the more extensive the split in the cervix appeared. As I worked

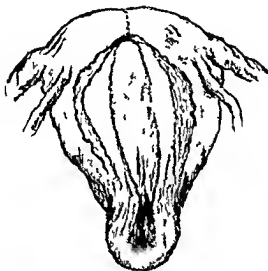


Fig. 485—Case I. Cleft in anterior uterine wall extending up from cervix.

slowly upward the cleft was seen to extend onward into the fundic portion of the uterus and an explanation was now found for the depressed area seen in the cystoscopic picture posterior to or above the fistulous opening. The uterus had been split anteriorly by the curetment, and the bladder had prolapsed into the endometrial cavity and become adherent.

After the fistulous tract had been dissected free I was still not at the upper limit of the cleft uterus and in pushing the bladder completely away from the underlying structure the

peritoneal cavity was inadvertently opened. The split uterus could now be directly observed, and was found to be cleft in its entire length in the midline with the exception of a small area, perhaps a centimeter, in its extreme upper portion. The lateral walls had retracted and the endometrial lining was everted, much as if one had turned back the edges of his unbuttoned coat (Fig 485).

The successive steps in the operation were now as follows. The peritoneal cavity was closed with plain catgut making all but the upper pole of the uterus lie extraperitoneally. A purse-string suture was placed around the fistulous opening, and the edges inverted. Two layers of reinforcing sutures were then placed in the vesical wall, burying the original suture line deeply. Our next problem was to rebuild the uterine body if possible, for the patient was young and it was deemed advisable to preserve menstrual function, and not sacrifice the womb. The retracted edges were therefore slightly freshened and the uterus reconstructed over a uterine sound. The bladder was now allowed to fall back to its normal position and lightly fix to the uterine wall. The vaginal flap was then firmly closed without drainage, a retention catheter placed in the bladder and the patient put to bed in the prone position.

An uncomplicated convalescence followed the catheter being removed on the fourteenth day. When the patient left the hospital there was no leakage of urine, and in a letter received some months later the young lady assured me that she was in perfect health.

**Case II**—A woman thirty nine years old, who had borne 9 children, entered the hospital with the following history. Three months previous to her admission she had been delivered of her ninth child. Labor was long and difficult, the attendant being a midwife. After eleven hours of constant effort the head of a large child was born, but the shoulders refused to follow. The midwife allowed the patient to remain in this condition for a long period of time before calling a physician. The doctor who was called on the case evidently had a very limited knowl-

edge of obstetrics, for, although the child was dead, he seized the head and pulled the shoulders through the pelvis by sheer force without any effort to lessen the diameter of the shoulders by cutting the clavicles

Urine at once began to flow from the vagina, as the base of the bladder, previously weakened by pressure necrosis, had evi-

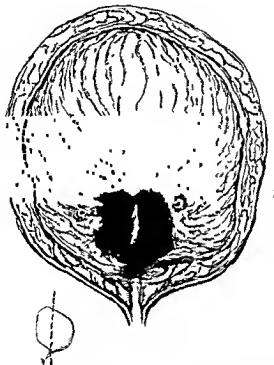


Fig 486—Case II Cystoscopic picture showing extent of destruction in trigon region and relation of ureters

dently been ripped open by the forceful delivery. The physician allowed the patient to remain at home for a period of three months with absolutely no special care of the genital tract, in the hope, no doubt, that the fistula would close. Friends finally sent her to the hospital, where she came under my care.

Examination showed a very large, fat woman, with a foul-smelling discharge, and a constant dribbling of urine from the

vagina. There were marked ulcerations about the vulva, which were covered with incrustated material. On vaginal palpation one could easily pass a finger into the bladder just in front of the cervix.

The cystoscopic report on the condition of the bladder by the consulting urologist was as follows. The bladder trigon is very congested and edematous. A fistulous opening about the size of a large thumb can be seen in the midline immediately adjacent to the sphincter area. The left margin of this opening is incrustated with phosphatic deposits. The right ureteral orifice leads directly into the edge of the fistula, the left enters the bladder  $\frac{1}{4}$  inch from the left lateral margin of the fistulous opening (Fig 486).

After a long period of vaginal and vesical preparation, in which the ulcerated areas were completely healed the patient was finally brought to operation and the fistula attacked from below. In this case there was a relaxed vaginal outlet, but I was hampered in my manner of approach by the excessive fat deposits in and about the patient's genitalia. Nevertheless I succeeded in doing a wide and free dissection without the aid of a paravaginal incision.

In freeing the vesical wall from the vaginal flaps much dense scar tissue was encountered and when this was finally dissected free the opening into the bladder was found to be much larger than when seen through the cystoscope. I was able to pass 3 fingers into the defect without the least difficulty. During the entire dissection the right ureter was constantly in view spouting urine into the wound, and made a splendid guide at a later stage of the operation for the passing of sutures.

When the bladder had been amply freed the fistulous opening was closed with a continuous Dulox suture, turning the ureteral orifices upward or inward, placing the stitches in such a way as to avoid their constriction. Because of the size and extent of the defect in the bladder wall it was found that I had used all the slack vesical tissue in closing the opening and it was therefore impossible to place any reinforcing sutures because of the danger of tension on the bladder wall. The vaginal

flaps were, therefore, closed with great care, leaving as little dead space as possible, and thereby acting as a supporting structure for an otherwise weak suture line. A retention catheter was placed in the bladder, and the patient put to bed in the prone position.

In this case I removed the catheter on the eighth day, and paid the penalty for haste by having a small leak develop in the extreme upper left angle of the wound. This, however, healed readily when the patient assumed the erect posture, and I was able to see her some weeks later perfectly dry and with normal bladder function. A cystoscopic examination at this time confirmed our findings of complete closure with normal ureteral function. The patient has since been perfectly well.

**Case III**—A woman forty one years old was operated on in February of last year for some type of uterine hemorrhage, a total hysterectomy being done. Following this urine began to dribble from the vagina. Three months later the surgeon who had done the hysterectomy attempted a closure of the existing vesicovaginal fistula without knowing the exact intravesical position of the opening as no cystoscopic examination had been made. The result was a failure.

Some time later I was asked to see the patient, and on examination found the following. The vaginal tract had been badly distorted by the contraction of scar tissue and the pull of the vaginal fixation. The uterus, including the cervix, had been entirely removed, and a constant dribbling of urine was observed coming from the extreme upper left angle of what once had been the left lateral vaginal fornix. The fistulous tract could not be seen, and only its general location surmised.

Cystoscopic examination showed both ureters intact and functioning normally. Above and to the left of the left ureteral opening a small hole, about the size of a quill, could be seen passing through the vesical wall.

It was my good fortune to be able to pass a ureteral catheter from the inside of the bladder through this opening out into the vagina. The cystoscope was then withdrawn, and the

other end of the catheter allowed to come out through the urethra I now had my fistula on a string as it were and by wide dissection was able to reach the opening and completely free it from the underlying tissues. The scar in this case was extremely thick and much difficulty was encountered in following the proper planes of cleavage. Despite its high position and the scar tissue the fistula was reached from below without the aid of a Schuckhardt incision.

The process of closure and the after care was carried out in much the same manner as that previously described in the other 2 cases and the result was most gratifying the patient having remained dry since the operation.

**Case IV**—A woman in her early forties had a total hysterectomy performed, at which time a small hole was cut into the bladder. This accident was evidently not noticed at the time and the abdomen closed. She at once began to drain urine through the vagina and came under my observation some weeks later with a definite fistulous tract high in the central portion of the anterior vaginal wall. The opening was within  $\frac{1}{4}$  inch of the transverse scar which closed the vaginal vault. The operator, who had done the hysterectomy quite correctly anchored the upper vaginal cuff to the ligamentous support which had been severed from the uterus. This gave the desired support to the genital canal, but pulled the vagina and bladder markedly upward making the fistula inaccessible to ordinary dissection.

Cystoscopic examination showed the opening in the mid line of the trigon almost on a level with the ureters but slightly above them and about the diameter of a thin lead pencil. Both ureters were functioning normally.

Because of the inaccessibility of the fistula, due to the depth of the artificially elongated vagina, an extensive paravaginal incision had to be made in this case. Even then the dissection had to be carried out more or less in a hole, as it was impossible to pull down any structure, the cervix having been removed and the fistula being firmly adherent to the upper vaginal

fixation scar After much maneuvering the bladder was freed extensively and the fistulous tract eventually brought down for suture A double row of Dulox gut was used and the vagina closed firmly over the whole area The paravaginal incision was sutured with deep interrupted silkworm gut a retention catheter inserted in the bladder and the patient put to bed on her abdomen

An uneventful recovery followed all areas healing without slough and the fistula remained permanently closed The patient left the hospital in her fourth week dry and comfortable

**Case V**—This case one of the most complicated in the series just described is interesting both from the standpoint of the poor obstetrics which caused the lesions as well as the resulting pathology and the problem of closure

A young woman twenty three years old was delivered by the use of forceps Evidently the instrument was applied before complete dilatation had taken place for a very severe laceration of the cervix was noted on examination Not knowing just what was done at the time of delivery one must piece together the evidence as presented by the pathology and draw conclusions from this The child according to the mother's statement was large and when the head would not come down easily considerable force must have been used in its extraction as a 2 to 3 cm separation of the symphysis pubis resulted

The operator evidently braced his forceps against the pubic arch and pried the head out of the pelvis for all structures were completely severed from the left pubic arch in its anterior portion the clitoris and urethra and their attachments being cleanly shaved away from the bone and pushed to the right The cervix was deeply cleft on the left side the tear extending up to the bladder and in addition a hole was torn into the vesical wall through which I could easily pass my index finger

The delivery took place on June 27th and on July 16th she was admitted to the hospital Her condition at this time was bad The laceration about the left pubic arch extended upward over the mons veneris and was infected and the entire

vaginal lesion was in such shape that an immediate operation was out of the question

Considerable time was necessary to clean up the lacerations and carefully study the intravesical condition. Several cystoscopic examinations were made, and the following pathology found. The opening into the bladder was more than a centimeter in diameter located anteriorly under the left pubic arch 2 to 3 cm from the symphysis. The ureter on the left side could not be located as it seemed to lie in a deep pocket below and behind the fistula. Dye stuff injected into the vein could be seen to spurt into the bladder, so I knew that the left ureter was functioning and intact. The right ureter was normal in every way.

On August 22d the patient was ready for operation, and a closure was made. The scar tissue about the cervical tear was dissected away, and the incision extended upward to the fistulous tract under the left pubic arch. The bladder was next pushed off of the cervix and then freed from the pubic bone over toward the midline. This gave considerable mobility to the tissue, and the fistula was pulled down and sutured with a double row of Dulox gut. The cervical edges were then freshened and sutured with interrupted chromic gut. It was now found that in dissecting away the scar tissue considerable vaginal wall had been sacrificed, and it was therefore impossible to cover over the denuded area completely. I finally patched together sufficient vaginal wall to cover most of the areas borrowing tissue from wherever possible. The vaginal closure was however, not complete, but the best that could be done at this time. A retention catheter was sutured in position and the patient put to bed on her back, as the fistula was anterior in this case.

Her postoperative course was stormy and presented the following complications. Thirty six hours after operation the patient developed a temperature of  $104.4^{\circ} \text{F}$ , pulse 162, respiration 28, with severe pain in the left side of her back. The urine output had been 360 c c for the first twenty four hours and was continuing at about this rate.

As I had not been able to locate the ureter on cystoscopic



examination I thought that perhaps it had been tied off and therefore advised a nephrotomy. This was done but to our surprise no urine under tension was found and the kidney looked fairly normal. The patient was put back to bed and very curiously the temperature dropped to 99.8° F pulse 132 respirations 26. In the next twenty four hours the urine output by way of the bladder jumped to 1460 c c with only a few drops draining from the back. I therefore felt sure that the ureter had not been ligated but what caused the symptoms is still unexplained.

The following day the one after the nephrotomy the temperature again rose to 100° F but the pulse rate dropped to 128 and the urine output through the catheter by way of the bladder increased to 3070 c c. The rest of the convalescence was uneventful. The temperature quickly returned to normal and the fistula remained closed. The catheter was removed from the bladder on the tenth day and the nephrotomy wound closed spontaneously on the thirty eighth day. The patient is now up and about completely cured of her fistula but still in need of a subsequent plastic operation to restore her pelvic floor.

Case VI—An Italian woman forty one years old who had given birth to 17 children entered the hospital in labor presenting the abnormality of a hydrocephalic child *in utero*. The condition was recognized and a craniotomy promptly performed. During the delivery or when the cranoclast was inserted a hole was unfortunately made in the bladder and the patient immediately began to pass urine through the vagina.

After a rather stormy puerperium the patient was sent to my service with the diagnosis of vesicovaginal fistula but examination showed this to be an error as no opening could be found in the vaginal canal. The injection of dye into the bladder soon showed that the defect was higher in the genital tract as the colored urine trickled down through the cervical canal. Cystoscopic examination showed a small opening in the mid line about 2 cm above the level of the ureteral orifices. Both ureters were functioning normally. A diagnosis of vesicocervical

fistula was made which the subsequent operation proved to be correct

The patient was scheduled for operation, and an attempt made to reach the fistula from below. An unexpected difficulty developed at this time as the vaginal tissue was so friable that it was impossible to secure a hold on any portion of the wall or cervix without the instrument at once tearing out. Where the tenacula would grip for an instant as soon as pull was exerted a strip of tissue would come away making dissection impossible. The operation by the vaginal route was therefore abandoned and a week later an abdominal section was done with the object of completely removing the uterus.

A hysterectomy was begun in the usual manner and the bladder pushed off of the cervix. No difficulty was encountered in doing this and presently the fistulous opening in the cervical wall came into view. The tip of one's little finger could be inserted into this tract which was sharply defined but surrounded by cervical tissue which was exceedingly soft. In raising the uterus to place clamps on the uterine vessels the fundus and upper portion of the cervix tore completely away from the lower portion of the cervix through the fistulous tract. This took place when very little traction was being exerted on the uterus and gives an idea of the friability of the tissue. The cervical stump was removed and a search begun to locate the fistulous opening in the bladder.

It was impossible to definitely determine just where the opening in the bladder wall had been as the tract here was evidently a tortuous one. Probing showed no direct communication through the several areas which looked as if they might harbor the defect. As we were well above the ureters I therefore took the entire area where the fistula must be located, and plicated the tissue in such a manner that all suspicious depressions were completely covered by healthy tissue. A row of reinforcing sutures was placed over this and the abdomen closed without drainage.

The patient remained dry until the catheter was removed on the ninth day. Following this she dribbled urine slightly

through the vaginal wound for some time but in ever decreasing amounts and only when in the recumbent position. One month after the operation she left the hospital with her fistula completely closed and vaginal and abdominal wounds securely healed.

I have reported these cases somewhat at length to give you an idea of the numerous complications which may arise in any fistula about the female genital tract and also to show the tediousness of the operative procedure. Let me again point out that success in the closure of vesicovaginal fistulae is dependent upon a multiplicity of detail every step of which must be painstakingly carried out. Even with the best technic a certain number of cases will no doubt be recorded as failures. It must however be our goal to so minimize these failures that vesicovaginal fistulae with their distressing complications and sequelae will no longer be the bugbear of physician and patient alike.

## CLINIC OF DR M G SEELIG

### JEWISH HOSPITAL

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#### SURGICAL TREATMENT OF ANGINA PECTORIS

I SHALL devote this morning's clinic to 2 cases of more than common interest. One of the patients that I shall operate upon is a male the other is a female. Both of them suffer with definite symptoms of angina pectoris both of them have been under the care of our excellent internist Dr Albert Taussig and both of them have failed to secure relief from medical treatment. I shall purposely say very little regarding the medical phases of the problem because never having performed the operation of sympathectomy before I shall have to work slowly and guardedly and shall probably need all the time at our disposal. I may say to you however that the first patient who has all the clinical and laboratory evidences of valvular and myocardial disease, suffers from agonizing precordial pain that sometimes persists for days and says that she is completely incapacitated. To all outward appearances she is a well preserved woman unusually calm and sensible. If one may judge from the literature with any degree of assurance this woman should profit greatly from the operation. The other patient however the man has been more of a problem for us. Dr Taussig has watched him for several years suspecting for the first few months that he was dealing with a case of coronary artery thrombosis. The course of the disease seems to have disproved that diagnosis. The patient has severe attacks of angina pectoris brought on by the slightest activity. The electrocardiograph shows a disturbance in the normal wave arrangement, but physical examination has always failed to reveal anything significant. There are several facts that point to a neurosis pure and simple. Both Dr Taussig and I have

serious doubts regarding the wisdom of the performance of the operation of sympathectomy in this instance. We have communicated these doubts to the patient and his family, who understand fully that we are willing to err in the hope of releasing this patient from the thralldom of his precordial pain.

What we shall do is to remove the cervical sympathetic from just above the superior ganglion to just below the middle ganglion. The classical operation of Jonnesco includes the inferior ganglion but recent evidence shows that the extra risk of including the inferior ganglion is not warranted by the results obtained.

Partial excision of the cervical sympathetic as a palliative measure in angina pectoris is based on severance of a portion of the path through which the pain impulses travel. This is a very complicated problem in physiology particularly clouded for the surgeon who like myself does not know whether to accept Mackenzie's or Allbutt's theory of the causation of pain in angina pectoris and who is told by neurologists, neuro-anatomists and neuropathologists that in principle the operation is wrong but that it is nevertheless warranted because in practice it undoubtedly demonstrates its efficacy in a satisfactory percentage of cases. The facts in the story are that in 1899 Franck recommended the operation that after a period of twenty years Jonnesco first developed the technic of its performance and that since then in Europe, England and America there has been a very steady publication of favorable case reports.

Owing to the very evident risks incident to the use of volatile anesthetics these patients are practically always operated upon under local anesthesia. We shall use  $\frac{1}{2}$  per cent novocain. I infiltrate obliquely from just above the tip of the left mastoid process downward along the sternomastoid to the sternal end of the clavicle. (The left side is selected on account of the usual left-sided distribution of the pain. Sometimes the operation must be repeated on the right side before relief is obtained.) The skin is now incised along the line of infiltration and dissected back for a short distance on both sides. These two

spring retractors now hold the wound open, and I locate my vascular hundle made up of carotid artery and internal jugular vein, enclosed in a sheath. Here it is, and I retract it forward. Now I search for the sympathetic which should lie just back of the sheath. I do not seem to be able to find it. I have seen other surgeons experience this same difficulty, although it is not mentioned in any descriptions of the operation that I have read. In cadaver dissections I have found the sympathetic adherent to the sheath of the vascular hundle. Let us look for it there. With blunt dissection I come down upon a nerve with a ganglion on it. It seems to be the superior cervical ganglion of the sympathetic. But the vagus lies within the vascular sheath and it also has a superior ganglion. Perhaps this is the vagus. I press upon it with my forceps and the heart slows down. I release pressure and you will note that the anesthetist counts aloud more rapidly. I press again, and the count is slower. It is the vagus. In applying this pressure I use caution, for the recurrent laryngeal fibers run in the vagus and a distressing hoarseness may be provoked by unduly strong pressure. Electric stimulation would undoubtedly be better. Further blunt dissection along the posterior wall of the sheath brings this other nerve into view. Here is a ganglion on it. I dissect the nerve downward and find another ganglion, the middle one, pressure does not affect the pulse. This is the sympathetic. I now free the trunk of the nerve, beginning just below the middle ganglion and working upward. I am careful to divide all the small branches running out from the middle ganglion. Now I sever the trunk below the middle ganglion and, using the free trunk as a rein, I apply mild traction until the superior ganglion comes clearly into view. This rather large branch coming off the lower part of the superior ganglion and coursing downward and forward is the cardiac branch. I sever it, and next I divide the sympathetic trunk above the ganglion and remove superior ganglion, inferior ganglion, and intermediate nerve trunk. All bleeding is now checked, and I sew the wound up without drainage.

You will notice that the left pupil is markedly contracted

and the left side of the face moderately flushed. These signs indicate that the sympathetic path has been severed. A slight narrowing of the palpebral fissure and enophthalmos will be noticeable later. Small pupil, narrow lid fissure, enophthalmos and lowered tension in the globe are known as Horner's syndrome.

The second patient was subject to exactly the same procedure as the first.

**Postoperative Note** -- Both patients convalesced normally. The wounds healed primarily. The woman never had a twinge of heart pain from the time the nerve was removed up to her last report four months after operation. The man has not been improved in any particular, even though he is inclined to lead himself to believe that his pains are a trifle more bearable. I am inclined so strongly to believe that he suffers from a neurosis that I shall not attempt to operate upon his right sympathetic.

## DISEASES OF THE APPENDIX

### ENDOMETRIAL IMPLANTATION IN THE APPENDIX

THIS morning shall be devoted to appendicitis. I do this very deliberately, in order to demonstrate to you that the subject is not as hackneyed and uninteresting as one would be led to believe from the frequency with which appendices are removed. In my early intern days I was taught by my chief that there were few operations simpler than appendectomy, but that, conversely, the operation could be most perplexingly difficult. I have never found any reason to modify this dictum, but I have found frequent occasion to note that the diagnosis of appendicular disease also varies from the patently simple to the bafflingly complex.

I shall show you 2 patients recently operated upon, and after discussing their case histories I shall demonstrate to you the technic of one of the steps in the operation of appendectomy.

Our first patient is a woman thirty-seven years old, married and sterile. She was admitted to the hospital three weeks ago, suffering acutely with abdominal pain. She referred the pain more or less indefinitely to the right iliac fossa, and was inclined to believe that the eating of raw pineapple was responsible for the attack. She vomited moderately before admission and had a diarrhoea lasting for several hours. She has not had a chill, but she thinks she had high fever before admission. Her history was negative except for the fact that she has had drenching night-sweats and that two years ago she had an attack similar to the present one. Menstruation has always been normal and not related to the attacks.

Examination of the patient revealed exquisite tenderness over McBurney's point, but there was no muscle rigidity and no rebound pain. Vaginal examination revealed in the right fornix an egg-shaped mass, tender, elastic, and closely con-



nected with a normal sized movable uterus. The mass extended well up beyond the reach of the vaginal examining fingers. All laboratory findings were negative. Temperature and pulse were normal on admission.

The abdominal tenderness was very significant but without fever leukocytosis and rigidity was scarcely adequate to warrant an assured diagnosis of appendicitis. Moreover the facies

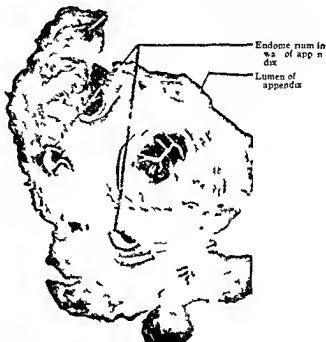


Fig. 487.—Low power section transversely through the appendix showing endometrial tissue in the muscular layers.

of the patient did not strongly suggest acute peritoneal involvement. The mass in the pelvis was puzzling. I shall read to you from the history my note made after my first examination. The mass is too low to be assuredly appendicular in origin and extends up too high to be assuredly adnexal in origin. The symptoms point to intestinal disease. Ileocecal tuberculosis must be borne in mind (severe night sweats). Observation is advised. She was observed for eleven days when

suddenly she had another severe attack of pain without fever, chill, or vomiting. I then decided upon exploration, feeling that we should most likely find a low appendix abscess of the more chronic or so-called latent type.

The exploration disclosed a mass the size of a hen's egg attached to the flare of the pelvis. The fimbriated end of the right fallopian tube was fused in the mass, as was also the cecum; but the appendix was not demonstrable. By blunt dissection

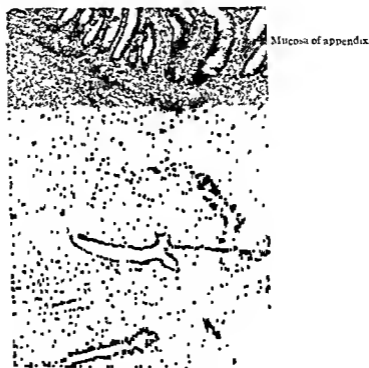


Fig. 488.—High-power section showing endometrial gland and stroma just beneath lumen of appendix.

the mass, with the involved cecum, was freed from the side of the pelvis. The posterior surface of the cecum was ragged, friable, and covered with granulations that bled freely. The bed from which the cecum had been freed was likewise made up of a friable, granulation-like mass that resembled carcinoma. The appendix was finally located, curved on itself like a snail shell, and buried in the posterior cecal wall. It was removed

and was found to have a stenosis at its middle point. There was no perforation demonstrable.

The wound was closed around a small drain and the specimen sent down to the pathologist. His first report was "adenocarcinoma of the appendix," but after further thought he decided that the lesion was a benign one due to the implantation and

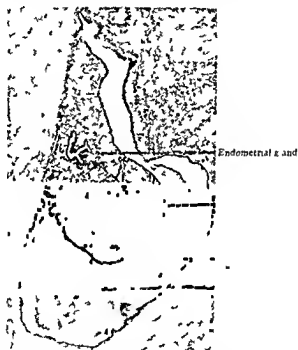


Fig. 489.—High power section. Cavity in wall of appendix partially filled with blood-clot and endometrial tissue.

infiltration of endometrial tissue into the appendix escaped from the fallopian tube.

So-called endometrial implantation has been recognized recently as a result of the admirable work done by Sampson of Albany, N. Y. This case represents the sixth recorded case of implantation in the appendix. I believe, however, that as we learn better to recognize the lesion we shall find the disease much more common than we now suppose it to be. It is in no

sense an infiltrative malignant process but represents rather the escape of endometrium through the fallopian tubes with implantation primarily in the ovaries, where the implants burrow and form cysts (so-called chocolate cysts) which later rupture and disseminate their endometrial contents in the pelvis. Frequently they land on and grow in the sigmoid, simulating cancer, and, less commonly, as in our patient, they infiltrate the appendix and cecal region.

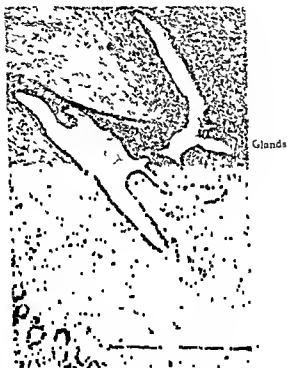


Fig. 490 —Well developed endometrial tissue in close proximity to mucosa.

The following four lantern slides will show you the microscopic appearance of the endometrial implants (Figs. 487-490).

The treatment of this condition is based on two fundamental facts (1) The endometrial tissue comes originally from the fallopian tubes, through which it escapes from the uterus. Falling on the ovaries, as a rule, it establishes there brood centers, in the shape of small chocolate cysts. These cysts rupture, scattering the endometrial tissue throughout the pelvis. (2)

The lesion is benign growth ceasing with the climacteric. It is sufficient therefore to remove the primary focus in the ovaries by oophorectomy and then the secondary lesion by appendicectomy. Sampson recommends total hysterectomy but this seems to be a very radical procedure.

#### APPENDICITIS AND SALPINGITIS

This second patient I am presenting in order to emphasize another aspect of appendicitis, a purely clinical phase of the disease as contrasted with the pathologic problem which we have just discussed.

This young woman is married and sterile. She entered the hospital three weeks ago in the midst of an acute attack of abdominal pain. I shall not go into her history in detail further than to tell you that it is word for word a text book description of acute appendicitis. Likewise the physical examination of the abdomen disclosed all the signs typical of acute appendicitis. Examination of the pelvis through the vagina furnished additional data however that were no less important than confusing. To the right of the uterus was an acutely sensitive mass the size of a tangerine orange and to the left a vague mass that could not be well palpated on account of pain, tenderness and abdominal rigidity. I was certain in my own mind that we were dealing with a case of acute pelvic peritonitis due to acute salpingo oophoritis and that the patient should be treated conservatively. I was persuaded however to alter my judgment and I operated upon the patient after having observed her for six hours. At operation I removed a perfectly normal appendix and two acutely inflamed pus tubes that lay in a pelvis filled with seropurulent fluid. The patient as you see, made a good recovery.

I show you this patient because she presents a problem that I have never been able to solve to my own satisfaction. I have felt chagrin more than once by mistaking acute pyosalpinx for appendicitis, discovering my mistake only after I had opened the abdomen. These mistakes however, have practically always occurred in cases where vaginal examination

yielded negative findings. Even now I know no way of protecting myself surely against such an error. I have grown to be suspicious of acute lower abdominal disease in servant girls and in certain married women whom I feel have been tampered with in order to induce an abortion. These women will never furnish one a clue, although in practically every instance they could do so if they so desired; and they usually have confessed the truth to me after I have confronted them with the facts disclosed at operation.

I could easily outline a list of the symptoms and signs that differentiate acute disease of the adnexa from acute disease of the appendix. But to what purpose, when in the end I should have to tell you that the only helpful sign in a difficult case is the presence of palpable adnexal disease. In the case we are discussing there was clear-cut palpable evidence of adnexal disease, and yet, as I told you, I allowed myself to be persuaded to operate, instead of practising conservative delay. Why? Colleagues who saw the patient with me and whose judgments are, as a rule, better than mine felt that even though the adnexa might be acutely inflamed, the lesion might also be accompanied by acute disease of the appendix. Acute disease of the appendix is not a disease to be temporized with. I feared delay under the circumstances, so I operated, happily securing a favorable result in spite of an incorrect diagnosis.

#### THE APPENDIX STUMP

This third case of the morning I shall operate upon in order to demonstrate our technic of treating the appendix stump.

The patient is a young man who furnishes a history of recurrent attacks of appendicitis. He went through his last attack several weeks ago and has consented to the removal of the offending organ.

I make a  $2\frac{1}{2}$ -inch incision just mesial to McBurney's point over the outer third of the rectus muscle. I incise the rectus sheath, retract the muscle belly inward, being careful to have the deep epigastric vessels in the concavity of the retractor. I now incise the peritoneum. Here is the cecum and here is the

appendix kinked thickened and slightly adherent to the pelvic wall I deliver it easily Now I clamp and divide the mesentery and tie it off And now I want to show you our treatment of the stump

With a No 2 strand of chromic catgut I tie off the appendix about  $1/16$  inch from the cecum I tie it tightly and I am careful to use three knots I cut this ligature so that it is about 3 inches long Now I clamp the appendix with a crushing clamp placed  $\frac{1}{4}$  inch distal to the ligature Next I place a moist split compress over the cecum allowing the appendix to come through the split Thus I protect against possible soiling I now divide the appendix immediately proximal to the clamp holding the stump by the long ligature while my assistant steadies the clamp The assistant drops the clamp and appendix in the basin while I thoroughly carbolize the stump taking care to penetrate thoroughly into the lumen I remove the split compress hold the appendix up by the ligature while the assistants retract the wound and then allowing the stump to drop into the peritoneal cavity without touching the wound edges I cut the ligature short I pull the omentum down over the stump and then close the abdominal wall in layers

In 1904 I published a paper recommending this form of treatment of the stump At that time more than 2000 cases had been treated in this simple manner by the surgeons of Mt Sinai Hospital of New York Since that time many thousand cases have been done to the complete satisfaction of at least a dozen of my personal surgical friends, and yet the method has never commanded general approbation It seems to lack the elements of refinement that appeal so strongly to the better surgical instincts and has had to give way to the more popular method of inversion of the stump Let us look into these methods a little more closely

Broadly speaking we may treat the stump in one of two fashions (1) We may simply tie off the appendix, as I have already described and drop the carbolized stump into the peritoneal cavity (Fig 491) Instead of sharp division and carbolization, the actual cautery may be used (2) We may

invert the stump. This latter method has the supposed advantages of burying an infected stump and of giving a smooth surface at the site of inversion thus protecting against postoperative adhesions. Unfortunately the appendix carries the appendicular artery within its walls in a fair proportion of cases (16 to 50 per cent). If the stump is invaginated into the cecum without previous ligation of this vessel, there may ensue a compromising and even fatal bleeding into the colon. Such hemorrhages have been recorded in literature. Figure 492 illustrates the relations between the unligated vessel and the completely inverted stump. If in the attempt to guard against this type



Fig 491 — Simple ligature ablation cauterization of stump



Fig 492 — Complete inversion stump carrying unligated vessel with it



Fig 493 — Incomplete inversion appendix stump buried in cecal wall

of bleeding the appendix is ligated before inversion then it is impossible to turn the stump into the cecal lumen. Figure 493 shows how such a stump is, in reality, inverted into the cecal wall. Eventually this stump sloughs and the products of sloughing ulcerate through the cecal mucosa into the cecal lumen. But it is quite possible for the process to take place in the other direction the abscess emptying into the peritoneal cavity. Rydyger reported such a case with a fatal outcome. When we invert the stump therefore we run the risks of concealed hemorrhage and cecal wall abscess, to say nothing of accidental penetration of the cecal wall in applying the inversion suture



Furthermore cases are recorded of intestinal obstruction due to postoperative adhesions about the neighborhood of the stump even when the stump has been inverted. It is questionable whether covering the site of inversion with mesenterium may not even aggravate the tendency to provoke adhesions.

The arguments used against the simple ligation and cauterization method are

- 1 An uncovered infected stump is left in the peritoneal cavity
- 2 Adhesions may be expected to form about this stump

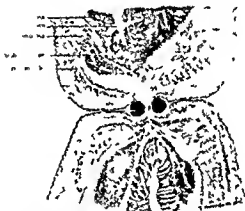


Fig. 494—Microphotograph (longitudinal section) through a ligated appendix to show stump formation

3 The stump is insecure because the ligature forces mucosa into contact with mucosa so that firm closure of the lumen of the appendix is interfered with

A properly cauterized stump is *not* infective. I have made innumerable and carefully checked bacteriologic studies of these stumps and have always found them sterile.

I have had numerous opportunities to inspect the site of these stumps months and years after simple ligation, and have practically always found the site smooth, dimpled and free from adhesions. Of course, adhesions may form just as they may after any intraperitoneal operation, but remember, that if they do form to the tip of the stump they will probably

not cause linking of the intestine, because as the ligature cuts through the stump comes away

There is no validity to the argument that closure of the lumen is insecure because the ligature forces mucosa against mucosa. The statement that mucosa is forced against mucosa is true, but look at this drawing (Fig 494) and see how the stump really looks under the microscope. The mucosa is crowded forward, and is protected by the folding over it of all the other layers of the wall of the appendix. The drawing you see was taken from a longitudinal section through a freshly ligated appendix. The simple tying of the ligature fashions a stump that is morphologically ideal.

If such a stump is sterile and strong and protected against bleeding if thousands of appendices have been so treated with perfect satisfaction, can you suggest why so many operators persist in the refinement of inversion, a method that is time consuming and itself not free from complications? Is such a refinement not akin to painting the lily?



## RHINOPHYMA

THIS patient I am showing you for the reason that she demonstrates a type of surgical disease that rarely causes real disability, but practically always brings in its train much personal embarrassment. In this particular instance the patient happens to be a woman. I have never before seen this disease in a female.

This patient suffers with rhinophyma and has practically secluded herself on account of her deformity. She told me that she was even ashamed to be too much in the presence of her husband. You could hardly picture to yourself the monstrous appearance of her nose, for she was operated upon several weeks ago, and at present seems to have a very well shaped set of features. I show you however, pictures taken before the operation, so that you may judge for yourself what has been accomplished (Figs 495-498). You may compare these pictures with this other group (Figs 499-502), showing a more aggravated state of affairs in a male patient who was forced to seek surgical aid because when he lay down at night the hulbous pendulous part of his nose dropped over his nares and closed them.

From the clinical side rhinophyma might be described fairly accurately if one merely set down the various descriptive terms which have been used in naming the disease: whisky nose, pound nose, nodular nose, growing nose, copper nose, elephantiasis of the nose, hypertrophy of the nose, lymphangioma, acne hyperplastica, fibroma molluscum, and cystadenofibroma. In the earliest stage of the disease the nose is a dark copper red, and there are dark red spots about it, particularly on the cheeks and at the glabella. Gradually there appear on the nose lentil size to pea size discrete or confluent nodules. As these nodules coalesce, and the soft parts hypertrophy, the whole organ becomes deformed by the tumor like nodules. The deforming growths occur usually at the tip and on both alæ, and may be

discrete and lobulated, or they may fuse, forming one large knob. Sometimes they are pedunculated. von Bruns reports a case in which the growth reached to the chin, and had to be held aside when the patient partook of food or drink. As a rule, there are only three irregularly rounded, lobulated growths situated at tip and alæ, but sometimes there are many small lobes separated by deep furrows. The nodules are usually soft and are coursed by dilated veins, and studded with comedones and acne pustules. Owing to the activity of the sebaceous glands, the surface of the nose presents an oily varnished appearance,



Fig 495



Fig 496

Fig 495 —Rhinophyma (front view) before operat on

Fig 496 —Rhinophyma (lateral view) before operation

and seems to be pitted by the wide open mouths of these glands. Pressure on the nodules causes macaroni like plugs of sebum to worm out from the sebaceous glands.

The disease occurs usually in the fifth and sixth decades, that is, the deformity is complete at these periods, the process having taken five to twenty years to develop fully.

There probably is no relationship between the disease and alcoholism. An analysis of the cases shows that there is an infinitesimally small number, compared with the number of alcoholics, and that many cases of rhinophyma occur in non drinkers.

The commonly accepted opinion is that rhinophyma, pathologically speaking, represents the terminal stage of acne rosacea that has passed through acne hypertrophica. In many instances the disease seems to rest on a congenital basis; Lassar believed that there was a predisposition to rhinophyma in wide-pored individuals. The essential pathologic process is a hyperplasia of the connective tissue of the soft parts of the nose, accompanied by a dilation of the blood-vessels, and hypertrophy or cystic degeneration of the sebaceous glands. The skin follicles show, in places, distinct evidences of suppuration. The open-



Fig 497.



Fig 498.

Fig 497.—Same patient as in Fig 495 after operation.

Fig 498.—Same patient as in Fig 496 after operation.

ings of follicles and of the ducts of the sebaceous glands are widened, so that they resemble deeply pitted pores, often giving to the nose the appearance of a sponge. No one has ever satisfactorily demonstrated the cause of the disease. Kaposi sought to prove that the connective-tissue growth, blood-vessel dilatation, and sebaceous gland degeneration were all secondary to an angioneurosis; but there is no marked consensus of opinion concerning this theory. Trendelenburg considered the disease as a new growth and grouped it under the head of fibroma molluscum, Lassar considered it a cystadenofibroma.

Rhinophyma is a familial disease representing some type of hereditary transmission. It occurs usually in the seborrheic



Fig 499



Fig 500

Fig 499—Rhinophyma before operation lateral view

Fig 500—Same patient front view before operation

type of individual. (The seborrheic type of Sabouraud may be described as an individual with yellowish tinted muddy thick



Fig 501



Fig 502

Fig 501—Same patient as Fig 500 after operation

Fig 502—Same patient as Fig 499 after operation

skin, the yellowish tint being most pronounced around seborrheic areas with a tendency to acne vulgaris in youth and acne

rosacea in middle life) The future rhinophyma subject shows a tendency toward flushing of the face on entering a warm room, after meals, or under excitement. This flushing leads, in time, to a chronic congestion, with secondary chronic infection of the skin of the nose and sometimes of the cheeks. This, in turn, leads to a chronic productive inflammation, with vascular dilation, connective-tissue formation, and dilation of the sebaceous glands into cyst formations. There is a marked thickening of the cutis vera, which throws the skin into folds and



Fig 503 —Showing rhinophyma in Indian race.

furrows. The end-result is the multiple formation of knobs or tumor-like masses.

The treatment of the disease is exclusively operative. The occasional recommendation to practice wedge-shaped excisions should be ignored. The most satisfactory operative procedure consists in shaving off the redundant tissue until the nose is brought back to what one assumes was its original form. In this shaving process two things should be borne carefully in mind (1) Do not shave too deeply, and (2) preserve a thin rim of epithelium around the nares. If the shaving is carried too deeply, we remove all sebaceous-gland rests and leave no



rid of epithelium from which as brood centers epithelization may spread This delays healing and even if the nose is grafted the resultant skin has a harsh white dry appearance so striking as always to command attention and cause comment Further more deep shaving may injure the nasal cartilages and set up a stubborn perichondritis If a thin ring of intact skin is not left around the nares serious disfigurement may result from the contractions incident to cicatrization Hemorrhage which is usually very free is checked with comparative ease by simple gauze pressure and the patient is sent to bed with a large well vaselined gauze pad over his nose The next day this pad is removed and the denuded area is strapped with imbricated strips of sterile zinc oxid adhesive plaster This plaster dressing is changed daily Under this simple dressing the patients shown in Figs 495 to 498 were completely healed in ten days It is not necessary to skin graft these patients Indeed von Bruns points out that grafting often leads to the development of retention cysts underneath the grafts with subsequent breaking through and ulceration

The role that rhinophyma plays in medical history and in classical medical art and caricature is not totally without interest even to a group of practical surgeons Dr Eugen Hollaender in his two volumes devoted to *Medicine in Classical Art and Caricature* and *Satire in Medicine* furnishes some striking copies of pictures that feature rhinophyma

And finally Fig 503 is not without interest from an ethnologic point of view Rhinophyma is fairly common in the American Indian This is a portrait of Wa Ha Gun Ta chief of the Chippewas (photographed by Mr William Burton of St Louis who kindly loaned me this copy) There are authentic records to show that the chief died in February 1922 at the age of one hundred and thirty seven years

## CLINIC OF DR EVARTS A GRAHAM

BARNES HOSPITAL WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

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### CHOLECYSTOGRAPHY

#### CASE I ACUTE HEMORRHAGIC PANCREATITIS, WITH PROBABLY RECURRENT ATTACKS FOLLOWED BY RECOVERY AFTER OPERATION DURING THE LAST ATTACK

THIS patient as you see, is a very obese young man who is nineteen years of age and of Jewish parentage. It is quite evident that he is having severe abdominal pain but no peristaltic waves are seen. Except for the points noted there is nothing noteworthy to be found on inspection except the diagonal scar in the right lower quadrant, which looks like an old scar of a McBurney incision for appendectomy.

His present symptoms began suddenly three days ago at 11 o'clock in the morning with severe abdominal pain located chiefly in the umbilical and upper abdominal region, followed by nausea and vomiting. These symptoms have continued until the present time. There has been nothing characteristic about the vomiting, no blood, or anything else noteworthy. He has taken sodium bicarbonate several times, with slight relief of pain. His previous history is very interesting. He states that he was well until six months ago, when he had a similar attack of pain. During the next five weeks he had three similar attacks, each of two or three days' duration. Finally, five months ago at night during one of his acute attacks, he was operated on for appendicitis at another hospital. The appendix was removed through a McBurney incision and the surgeon was astonished to find practically a normal appendix. No satisfactory exploration of the abdomen was made.

In fact, a satisfactory exploration cannot be made through

a McBurney incision unless one indulges in an unjustifiable amount of cutting of muscles and nerves. One of the most striking points emphasized by this case is that fact. Now the result of the operation in this case therefore was merely that a normal appendix was removed and the real trouble was not even discovered. We feel that all laparotomies should be accompanied by adequate examination of the abdominal contents except in those cases in which the presence of a severe acute infection would make such a procedure dangerous. At any rate if an operation is to be done at all, it should at least find the trouble. Moreover, the frequency of associated lesions in one or more organs is becoming recognized more and more as a fact which demands an adequate exploration for associated lesions. For example the gall bladder stomach duodenum, pancreas and appendix should all be examined when an operation is performed on any one of them unless the process is too acute to permit it. If the subject is a female, obviously the pelvic organs should be examined at least by palpation. In fact we feel that since cholecystitis is frequently secondary to a hepatitis<sup>1</sup> due to appendicitis an operation on the biliary tract is not complete unless an appendectomy is done also. For all these reasons therefore we have completely abandoned the McBurney incision in operating on the appendix, and I don't think it has been used a single time in this hospital for this purpose in five years. We prefer generally a paramedian vertical incision. The anterior sheath of the rectus is split longitudinally in a line corresponding to about its middle, and the muscle is then retracted outward before the posterior sheath is incised. This procedure has several advantages over one which splits the rectus muscle itself. It can be extended readily either upward or downward, it is less likely to cut the nerves supplying the rectus muscle which come from the lateral side of the sheath because the main trunks on the posterior sheath can be plainly seen and avoided, finally by interposing the

<sup>1</sup> Graham E A and Peterman M G Further Observations on the Lymphatic Origin of Cholecystitis Cholelithiasis and the Associated Pancreatitis Arch of Surgery 1922 vol iv p 23

uncut muscle between the sutures in the anterior and the posterior sheaths, it provides a very firm closure of the abdominal wall (Fig. 504). It is particularly fortunate that the abdominal organs which most frequently give rise to surgical conditions may be easily reached by an incision such as that described.

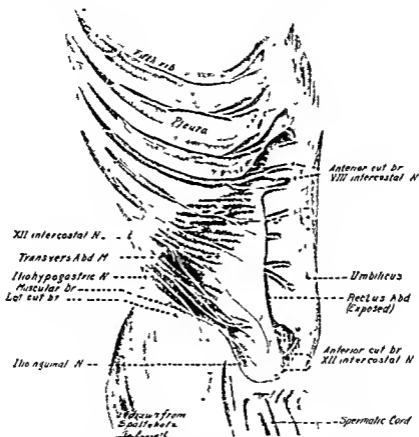


Fig 504—Dissection showing nerve supply to rectus muscle. It will be seen that if the muscle is retracted outward after splitting the anterior sheath there is less danger of injuring the nerve supply than if either the muscle is retracted inward or split. (From Spalteholz)

As examples one can mention the appendix, the gall-bladder, the duodenum, the pyloric end of the stomach, etc. Since also most of the acute abdominal symptoms arise from disorders of these structures, such an incision is most likely to afford the best approach to the offending organ in a case associated with acute abdominal symptoms.

Now, to continue with the history He made a normal convalescence from his appendectomy and he was free from pain for five weeks subsequently Since that time however, he has had four or five severe attacks of pain associated with nausea and vomiting These were identical in character with those which he had before his appendectomy Naturally therefore, he feels that he has had no benefit from his operation

On examination of the patient at the present time we find that there is tenderness all over the abdomen but most marked apparently in the right upper quadrant The muscles of the abdominal wall are rigid The leukocytes are 22,400 the temperature 100.2° F (38° C) the pulse 80 and of good quality, and the respirations 18 The urine shows a faint trace of albumin but is otherwise normal With this history and these findings before us are we justified in making a diagnosis of any kind?

FIRST STUDENT I think that a diagnosis of acute peritonitis from some cause would be justifiable

DR GRAHAM Could we go farther and arrive at any sort of an opinion of how the peritonitis has originated?

STUDENT A gall bladder which has perforated might cause a picture something like this

DR GRAHAM Yes, it might But cholecystitis is very rare at nineteen years of age Moreover, it is so rare for a gall bladder to perforate that emergency operations for acute gall bladder conditions are hardly ever justifiable

STUDENT The peritonitis might have arisen in a perforated gastric or duodenal ulcer

DR GRAHAM The history is not entirely typical of a perforated ulcer but yet it is suggestive because peritonitis associated with upper abdominal pain and tenderness in a young subject is more likely to be due to a perforated ulcer than to any other cause We are told furthermore, by the patient that soda relieves his pain somewhat The recurrence of the attacks is not incompatible with the idea of a perforation because peptic ulcers sometimes perforate enough to cause a local peritonitis which becomes walled off from the general peritoneal cavity only to

perforate again and repeat the cycle. Could this be an acute pancreatitis?

STUDENT Acute hemorrhagic pancreatitis usually occurs later in life and is associated with much more marked prostration than is seen in this case.

DR GRAHAM Yes. Most often it occurs between the ages of forty to sixty years. It does, however, occur usually in obese subjects such as this patient is. But it would be difficult to reconcile the frequently recurring attacks of this patient with the diagnosis of an acute hemorrhagic pancreatitis, and the patient is insistent that all of his attacks spread over a period of six months have been identical. It seems hardly likely, therefore that the peritonitis in this case could be due to a hemorrhagic pancreatitis but, regardless of further speculation as to the origin of the process, the indications for an exploratory laparotomy are clearly established. We shall proceed at once with the operation.

We shall make an upper right rectus incision of the type already described. As we open the peritoneum we find a large amount of bloody fluid. You see that this does not resemble at all fresh blood but it is rather a fluid that seems to be colored by blood that has undergone hemolysis. There is no pus. We have removed about 3 quarts of this fluid from the abdomen. Now as the omentum comes into view, the diagnosis is at once cleared up. There are numerous small pearly gray areas varying in size from a pinhead to lesions with a diameter of about  $\frac{1}{4}$  inch. Those areas have lost the luster of the other portions of the omentum. These little lesions reveal at once the true nature of the condition. What are they?

STUDENT They look like fat necrosis.

DR GRAHAM Yes. There can be no mistake about the fact that these are areas of fat necrosis. What is their significance?

STUDENT They are supposed to be pathognomonic of acute pancreatitis.

DR GRAHAM Yes. They signify an escape of a fat splitting ferment into the abdominal cavity, and experience has shown that the only condition which is associated with this picture is

a lesion of the pancreas which permits the escape of pancreatic juice into the abdominal cavity We shall at once, therefore, examine the pancreas This can sometimes be most easily exposed above the stomach sometimes between the stomach and colon, by going through the transverse mesocolon and sometimes by entering the lesser peritoneal cavity through the posterior sheath of the transverse mesocolon after lifting up the transverse colon In this case it seems most easy to expose the pancreas by going through the anterior mesocolon between the stomach and transverse colon We now have it exposed, and find it to be enlarged to about three times the normal in its transverse diameter It is also very dark blue and it is so necrotic that a fairly large piece together with smaller fragments can be readily scooped out with the finger We find also that the posterior wall of the stomach is adherent by firm adhesions to a portion of the pancreas near the head, which is not necrotic, and to the peripancreatic tissue The adherent stomach suggests that probably there is a gastric ulcer which has perforated into the pancreas at some time before Because of the close association of gall stones with acute pancreatitis it will be well to examine the gall bladder hastily for the sake of the information to be obtained The gall bladder, however, appears practically normal except for the peritoneal irritation everywhere apparent, and no stones are felt within it We shall therefore merely pass a cigarette drain down to the pancreas and rapidly close the wound The wound has now been closed The patient seems to be in excellent condition His pulse is 100 and of good quality We shall however, force fluids into him by rectum and also to some extent, subcutaneously We shall withhold anything by mouth until he has stopped vomiting In other words we shall treat him as any other case of peritonitis, although this case differs from the ordinary one in the respect that the peritonitis is a chemical one rather than an infective one of the type which, for example is associated with a perforated appendix We shall not force glucose into him until we are sure that he has sufficient pancreatic tissue left to take care of it We shall watch his urine carefully during the

next day or two for the presence of sugar. We shall, however, give him some glucose because obese individuals without sugar are very likely to develop an acidosis. Now, what about the prognosis in this case?

*STUDENT* I think it is very bad, in fact, practically hopeless.

*DR GRAHAM* The prognosis is bad, but not by any means hopeless. There is a common belief that practically all cases of acute hemorrhagic pancreatitis are fatal, but this idea is not borne out by the results of published cases. For example, Korte<sup>1</sup> in 1911 found a mortality of 38 per cent in a series of 118 isolated operations reported in the literature since 1905. Deaver and Ashhurst<sup>2</sup> in a series of 24 cases of their own reported a mortality of 37.5 per cent. This mortality seems high, but yet it shows that the majority of patients upon whom operation is performed recover. In contrast to this Dressman<sup>3</sup> showed in 1908 that there was a mortality of 88 per cent in 36 cases of clinically diagnosed acute hemorrhagic pancreatitis in which no operation had been performed. From the standpoint of statistics alone, therefore, it is apparent that the greatest hope of saving these patients lies in an operation which has as its object the drainage of the abdomen of the irritating fluid and the drainage of the pancreas itself. In this particular case the prognosis seems fairly good because of the good general condition of the patient. The most striking fact about the case is the frequent attacks which he has had with spontaneous recovery from each one up to this present one, for there seems to be little doubt that his previous attacks of severe abdominal pain were also due to acute pancreatitis. This case makes one wonder if acute pancreatitis is not after all a rather common condition. Is it not probable that many cases of severe epigastric pain of uncertain nature which clear up spontaneously are of this origin?

Acute hemorrhagic pancreatitis as it is generally recognized, constitutes, in reality, an acute necrosis of the gland. This is

<sup>1</sup> Quoted by Deaver and Ashhurst *loc cit*

<sup>2</sup> *Surgery of the Upper Abdomen*. P. Blakiston's Sons & Co. Philadelphia 1921.

<sup>3</sup> Quoted by Deaver and Ashhurst *loc cit*



one reason why it is important to relieve the pressure on the organ from swelling by incising its capsule. Opie<sup>1</sup> in 1901 described a case in which there was found at autopsy a gall-stone lodged in the ampulla of Vater, and he proposed the idea that the pancreatitis had been induced by a reflux of bile up the pancreatic duct. He supported this theory by experiments in which he showed that the injection of bile into the pancreatic duct under pressure could produce a condition analogous to the one recognized in the human. Later, also he collected 43 cases in which acute pancreatitis was associated with gall stones, in 9 of which a stone was found lodged near the ampulla of Vater. This idea, however has not been generally accepted as the usual cause of acute pancreatitis. Lund<sup>2</sup> called attention to the fact that in only a few autopsies on cases of acute pancreatitis had calculi been found at the ampulla, and, furthermore, that an abnormal arrangement of the bile and pancreatic ducts was necessary to enable a stone in the ampulla to cause a reflux of bile into the pancreatic duct. Mann and Giordano,<sup>3</sup> on the basis both of autopsy findings and of experiments, believe also that a reflux of bile could be only an infrequent cause of acute pancreatitis. Archibald<sup>4</sup> however, after very careful experiments has brought evidence which supports Opie's theory, but in addition, he thinks that a spastic contraction of the sphincter of Oddi can act like a stone blocking the ampulla. Other possibilities of modes of infection are, of course, through the blood stream, through the lymphatics, and by a spread of infection from a contiguous inflamed organ. Of the latter possibility a notable example is a perforation of a gastric ulcer into the pancreas. It is well known that ulcers on the posterior wall of the stomach have a tendency to perforate into the pancreas. Wildberger<sup>5</sup> has described this association of acute pancreatitis with the perforation of an ulcer. The findings in this case seem to make it probable that such was the origin of

<sup>1</sup> Diseases of the Pancreas J B Lippincott & Co Philadelphia 1903

<sup>2</sup> Boston Med and Surg Jour., 1921, clxxxv 771

<sup>3</sup> Arch Surg, 1923, vi, 1

<sup>4</sup> Surg Gynec and Obst 1919 xxvii 529

<sup>5</sup> Arch f Verdauungskr 1920 xxvi 192

the pancreatitis here. The strong fibrous adhesions between the stomach and the pancreas seem to warrant the idea that an ulcer of the posterior wall of the stomach had become adherent to the pancreas and had probably just recently perforated again into the pancreas, with the resulting picture of acute pancreatitis.

The mechanism of the production of the fat necrosis has been given by Douglas<sup>1</sup> as follows: "The basement membrane of the acini as well as the connective tissue binding the lobules of the glands is sufficiently destroyed to allow the escape of a certain amount of lipase, the fat splitting ferment. This attacks the fat in small areas, splits the fat globule into fatty acids and glycerin. The fatty acids combining with the calcium salts form an insoluble soap which appears in the omentum, mesentery and subserous fat, and on the surface of and about the pancreas as small white opaque spots." The literature on the subject of acute hemorrhagic pancreatitis has been reviewed recently in an article by Christopher,<sup>2</sup> who also reports a case which recovered after operation.

**Postoperative Course**—The patient made an uneventful recovery. The drain was removed on the fifth day. A serous discharge continued until the fourteenth day, at which time the wound healed completely. A determination of the blood sugar on the third postoperative day gave a practically normal finding of 0.1272. A sugar tolerance test made three weeks after operation was also normal. His urine, on repeated examinations, failed to show sugar. His kidneys excreted 50 per cent of the standard dose of phenolsulphonephthalein in two hours. An x-ray gastro-intestinal examination twenty-two days after operation showed perigastritis and periduodinitis which supposedly resulted from the pancreatitis. No conclusive evidence of gastric ulcer was found. The patient was known to be well and to have had no further attacks of pain eight months after his operation.

The salient features of this case, therefore, were unusual,

<sup>1</sup> Amer Jour Med Sci 1921 cxii 687

<sup>2</sup> International Clin cs 1924 iv 117

in that the patient had apparently repeated attacks of acute pancreatitis from which he has made a complete recovery after operation during the last attack. The origin of the pancreatitis seemed to be a perforation of an ulcer on the posterior wall of the stomach

#### CASE II CARDIOLYSIS FOR CHRONIC MEDIASTINOPERICARDITIS

This man whom I am presenting entered Barnes Hospital originally January 29 1923. At that time he was fifty five years old and his occupation had been that of a meat cutter. He entered the hospital because of weakness shortness of breath, swelling of the feet and ankles and palpitation of his heart. He had been totally incapacitated for about six weeks. He thought he had had a little fever at times. He had had some dizziness but no fainting. His general health had always been good except that he had been troubled with gas on his stomach for years. He had had no sore throats and there was no history of rheumatism. On examination there was a loud, blowing systolic murmur heard over the entire precordium loudest at the apex and transmitted far out into the axilla. He presented evidence of cardiac decompensation. But the most important point in the examination was the finding of Walter Broadbent's<sup>1</sup> sign of systolic retraction of the intercostal tissues in the left posterior region corresponding to the tenth and eleventh intercostal spaces. Not only was this sign present but also the additional one which J. H. Broadbent<sup>2</sup> emphasizes as being more important viz. systolic retraction of the costal cartilages and lower end of the sternum. The patient was under the care of Dr. Elsworth Smith<sup>3</sup> who found also a sign which has been previously described by him in connection with other cases of this kind, viz., a systolic tug on the diaphragm as seen with the fluoroscope. These findings definitely establish the presence of

<sup>1</sup> An Unpublished Physical Sign *Lancet* London 1895 ii p 200

<sup>2</sup> *Heart Disease and Aneurysm of the Aorta* New York 4th ed 1906

<sup>3</sup> *Cardiolysis for Chronic Mediastinopericarditis with Report of 2 Cases and Review of Literature to Date* *Medical Clinics of North America* 1920 iv, 835

adhesions between the pericardium and the chest wall, on the one hand, and between the pericardium and the diaphragm, on the other hand.

The condition is known generally as mediastinopericarditis. Not only may the pericardium be adherent to the chest wall, the diaphragm, etc., but it is usually also adherent to the heart in this condition. It is obvious, therefore, that the heart is seriously handicapped because at each beat it is forced to pull against the unyielding chest wall. As a result, sooner or later, the right auricle is likely to become dilated. This results in back pressure of the blood in the liver, and many of these cases develop a lesion of the liver known as Pick's pseudocirrhosis. Ascites is likely to be a result, but generally there is no edema of the legs. In this respect, therefore, the condition differs clinically from the ordinary cardiac decompensation. Also there is often an absence of any evidence of valvular disease. Pathologically, too, the liver differs from that of the ordinary passive congestion. Rolleston<sup>1</sup> describes the pathology of the condition as follows: "The liver often shows some scattered adhesions to the diaphragm. Its general appearance is that of advanced chronic venous engorgement. There is no general chronic peritonitis or universal perihepatitis, but the surface of the liver is usually somewhat irregular, as in ordinary venous engorgement, and often opaque. This opacity is due to fibrosis under the capsule, due to fibrous replacement, and on superficial examination resembles chronic perihepatitis, for which it has probably often been taken. Microscopically the liver shows marked chronic venous engorgement with very irregularly scattered islands of fibrosis. Much of this apparent increase in the amount of fibrous tissue is due to atrophy of the liver cells, allowing the existing fibrous tissue to come into prominence. . . . Taken as a whole, the amount of fibrosis is scanty, and may be absent in considerable areas. Under the capsule there are extensive atrophy of the liver cells and fibrous replacement. If microscopic examination was limited to a section from this

<sup>1</sup> Diseases of the Liver, Gall-bladder, and Bile-ducts, W. B. Saunders Co., 1905, p. 98

part of the liver there would appear to be extremely marked fibrosis. But the extent of the fibrous change is limited to a small area under the capsule. It is however enough to produce very definite opacity and as has already been pointed out imitates universal chronic perihepatitis. The two conditions are entirely different. In chronic universal perihepatitis (Zuckergussleber—iced liver) the fibrosis is on the outer surface of the capsule. The liver (in pericarditic pseudocirrhosis) thus shows the changes of chronic venous engorgement with rather more sporadic fibrosis than is usually present but there is no tendency to compression or narrowing of the branches of the portal vein as in genuine portal cirrhosis. Although there is as a rule no genuine cirrhosis comparable to portal cirrhosis it appears from Diemar's and Wells' figures that when calcification occurs in an adherent pericardium well marked hepatic cirrhosis is found in the great majority of cases. There is no very satisfactory explanation of why the hepatic veins should be more affected in this condition than the other tributaries of the inferior vena cava with the resulting effect on the liver and the occurrence of ascites without edema of the lower extremities. Rolleston suggests that it is possible that at the time of the primary pericarditis inflammation spreads to the mouths of the hepatic veins and by weakening their walls leads to dilatation and so to a freer entry of blood into them. The pericarditis is usually either rheumatic or tuberculous in origin. In this particular case it is difficult to say what the origin of the pericarditis was. There is nothing in the past history that is even suggestive of an attack of acute pericarditis and there is no evidence of tuberculosis. This case is also unusual in that there has been no demonstrable ascites at any time. Moreover the condition is said to be more common in children than in adults. Children with ascites and without edema of the lower extremities should be carefully examined for an adherent pericardium. Slight jaundice may be present. In this case it is absent.

With the idea in mind therefore of a heart which is mechanically handicapped by adhesions the thought at once occurs

Would it not be possible to remove much of the mechanical handicap merely by converting the adherent rigid chest wall into a structure which would yield with the beat of the heart and thereby diminish the amount of its work necessary to accomplish the systole? This was the idea which suggested itself to Brauer<sup>1</sup> and was first put to a practical trial by him. He suggested that if some of the ribs and costal cartilages overlying the heart were removed the result would be the substitution of a yielding chest wall for a rigid one. Since then the operation which he named "cardiolysis" has now been performed enough times to establish it as a thoroughly justifiable procedure in the presence of suitable indications. The object is, of course, not to free the adhesions, but to make them harmless. Although there have been some failures, the majority of the cases have been greatly benefited. For a review of the literature see the article by Elsworth Smith<sup>2</sup>. Summers,<sup>3</sup> of Omaha, in 1912 was the first to perform the operation in this country. Since his report of 2 cases in 1913 there have been, all told, scarcely a half-dozen cases reported from this country, and of this number 2 of the previous cases were operated on in St. Louis, one by Dr. Mudd and the other by Dr. Sachs. It seems hard to understand why the operation has not been done more often, particularly in the cases of non-tuberculous origin, since there must be many patients who could be improved by this operation. In the tuberculous cases, however, the results are not likely to be so good.

The whole question was fully discussed with the patient, and he consented to an operation. There were no special contra-indications to operation. His blood pressure was 152 over 76. His urine was normal except for a trace of albumin. His blood was essentially normal. The vital capacity was 2800, and the Wassermann was negative. The electrocardiogram showed the

<sup>1</sup> Die Kardiolysis und ihre Indicationen. München med. Wchnschr., 1902, xlix, p. 982.

<sup>2</sup> Cardiolysis for Chronic Mediastinopericarditis with Report of 2 Cases and Review of Literature to Date. Medical Clinics of North America, 1920, iv, 835.

<sup>3</sup> Jour. Amer. Med. Soc., 1913, xxvii.

presence of myocarditis<sup>1</sup> The operation was performed May 2, 1923 With novocain anesthesia the third fourth, and fifth ribs on the left side were resected from the border of the sternum to well out beyond the heart This resection included both ribs and costal cartilages Some of the sternum was removed with a rongeur The periosteum and perichondrium were carefully stripped from the pleura, so that there would be no regeneration of new bone or new cartilage The pleura was exceedingly thin and everywhere transparent, but it was not opened The pericardium was seen to drop back from the chest wall This was accentuated after the hand was passed under the sternum and after the attachments of the pericardium to the sternum were separated The patient was very nervous apprehensive, and excitable in fact a very poor subject for local anesthesia Immediately after separating the attachments of the pericardium to the sternum he complained of a sensation of great weight over the heart At the close of the operation a large dead space remained between the heart and the sternum After suturing the skin flap it was held down to the heart with gentle pressure on the dressings The patient withstood the operation well His pulse at the start was 100 and the same at the end of the procedure On the first postoperative day, although the pulse was of good quality and of an average rate of 110, the patient had moderate dyspnea He was also much depressed and apprehensive and he complained of a great weight in the precordium On the second day the average rate of the pulse was 120 He was given morphin and digitalin On the fourth day his pulse rose to 140 and the temperature to 103.6° F (39.8° C) The wound was in excellent condition, and the fever was unexplained He was digitalized daily From then on his convalescence was rapid On the ninth postoperative day he was transferred back to the medical service with normal temperature and a pulse of 120 He was feeling very much improved

He was discharged from the hospital on May 23, 1923 A

<sup>1</sup>A more detailed study of the heart in this case will be presented some time later by Dr. Elsworth Smith

discharge note by Dr. Elsworth Smith at the time states: "He is in better health than any at time since the onset of his present malady. Is now thoroughly compensated and sleeps and eats normally. There is no edema. The heart's action is regular and of normal tone. He can wheel himself the length of the ward and back without any evidence of cardiac decompensation."



Fig 505 —Photograph of patient in Case II taken two years and five months after operation

Since his discharge his improvement has been steadily progressive. He now reports back for observation a little more than two years after his operation. He is able to earn his living by office work. He can walk for about a mile without dyspnea. He sleeps well. In other words, he feels that the operation has been decidedly beneficial. We know even more than that. We



know that he has avoided the development of a pseudocirrhosis of the liver which almost certainly would have occurred. In fact, this case is apparently the first one in the literature in which the operation has been performed before the development of ascites. It should be done more often. An examination of the wound shows a good scar, and the pulsations of the heart are very conspicuous because of the retraction of the skin with each systole. If we had not removed the periosteum, new bone would have formed which would again have formed a rigid chest wall.

**Summary**—Cardiolytic for chronic mediastinopericarditis on a man before the development of ascites. Excellent result more than two years after the operation. This is apparently the first case in which the operation has been performed before the development of ascites.

#### CASE III. CHOLELITHIASIS. ADVANTAGES OF CHOLECYSTOGRAPHY

This patient, a woman fifty years of age, entered the hospital because of what she calls "chronic indigestion." For about five years she has suffered with frequent attacks of pain in the abdomen. Sometimes the pain has been severe, and at such times she has noticed that she is likely to vomit, but the vomiting does not relieve the pain. She has also observed that the pain often "goes through to the back" and when we question her more closely, we find that it goes to the region of the right scapula. She has noticed no relationship of the onset of pain to the time of taking food or even to the kind of food taken. There has been no vomiting of blood and no history of icterus. She is the mother of 5 children. What does this history suggest?

**STUDENT** It probably indicates either stomach or gall bladder disease.

**DR GRAHAM** Yes. It is a fairly typical history of gall bladder disease. This suggestion is rendered all the more likely because she has had 5 children. Multiple pregnancies predispose to disease of the biliary tract and even to the formation of gall stones. Moreover on the basis of probability alone, we know that a woman who complains of chronic indigestion is

more likely to have a chronic cholecystitis than a lesion of the stomach. It is now generally recognized that the most common organic cause of "indigestion" or "dyspepsia" is cholecystitis. Probably, as time goes on and as diagnosis becomes improved, we shall learn to recognize that cholecystitis is even more frequent than we now consider it to be. Physical examination reveals nothing noteworthy except in the abdomen. Here we find tenderness under the right costal margin, especially if we jab our fingers upward suddenly at the end of a deep inspiration. This tenderness has been attributed by some to the pain produced by contact with an inflamed gall bladder. In most cases however, we can easily demonstrate that the tenderness can be elicited all along the edge of the liver. It seems to be due, therefore, to a hepatitis, and the finding tends to confirm an observation to which we have frequently called attention, viz, that hepatitis is practically a constant accompaniment of cholecystitis.

In this case it would be desirable to have more accurate knowledge. We wish to know several things: (1) Has she any positive evidence of a lesion of the stomach or duodenum? (2) Is there any evidence of syphilis of the liver? (3) Has she positive evidence of gall bladder disease? (4) Is she a suitable case for operation?

It is especially desirable to know the condition of her stomach and duodenum because it frequently happens that peptic ulcer is associated with chronic cholecystitis. Chronic appendicitis is another condition which is frequently associated with these lesions. In a previous article Peterman and I<sup>1</sup> showed that the association of lesions of the portal system with cholecystitis finds a probable explanation in the fact that a hepatitis is produced by lesions of the portal system (peptic ulcer, appendicitis, typhoid fever, etc), and that, following the hepatitis, a cholecystitis occurs by transmission of the infection through the lymphatics from the liver to the gall bladder. An x ray examination of the alimentary canal in this case showed no abnormality.

<sup>1</sup>Graham E. A., and Peterman M. G. Further Observations on the Lymphatic Origin of Cholecystitis, Cholelithiasis and the Associated Pancreatitis. Arch. of Surg.

Syphilis of the liver, in its clinical picture, can imitate very closely a chronic cholecystitis. In this case however the Wassermann test was negative and there was no history suggestive of syphilis.

In order to obtain more positive evidence of gall bladder disease than the clinical picture offers various principles have been suggested from time to time as the bases of laboratory



Fig. 506.—Cholecystogram in Case III after intravenous injection of sodium tetraiodophenolphthalein. Two gall stones are seen which were not visible in the ordinary x ray film.

tests. Ordinary x ray examination helps but little. Liver functional tests give evidence of but little value because in the ordinary case of cholecystitis, there is so little disturbance of liver function as to be undetectable. Tests also like those devised by Vandenberg and by Fouchet which depend on estimating the amount of bile pigments in the serum have been shown not to have the great value in the diagnosis of cholecystitis which it was hoped that they might have. Similarly,

also, the Lyon Meltzer test has not proved itself to have the value diagnostically that some expected it to have. At best it could be only inferential because it deals only with the contents of the gall bladder, and it is very doubtful if the contents or even the mucosa itself are much affected in the early cases of cholecystitis, since most of the evidence points to the fact that cholecystitis usually begins as a peripheral lymphangitis rather than in the mucous membrane. A new principle was needed. This new principle was supplied in the method of cholecystography, which permits a visualization of the gall bladder by the x-ray. Since our first papers on the use of the halogenated phenolphthaleins for this purpose a voluminous literature has grown up.<sup>1</sup> The sodium salt of tetraiodophenolphthalein is the

<sup>1</sup>Graham, E. A., and Cole, W. H. Roentgenologic Examination of the Gall bladder. Preliminary Report of a New Method Utilizing the Intravenous Injection of Tetrabromphenolphthalein, *Jour Amer Med Assoc*, vol 82 p 613 (February 23), 1924

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substance which is now generally used for this purpose. The frequent toxic reactions which characterized the early work with the substance have now practically disappeared since it has become possible to obtain products of high purity.<sup>1</sup> Several thousands of patients have been examined by this method and no deaths have been reported. In our personal experience 550 patients have been examined. The substance may be given either intravenously or by mouth. If given by mouth, it is necessary to coat the material with something which will permit it to pass through the stomach unaltered. For this purpose various capsules and tablets have been devised.<sup>2</sup> If the acid of the stomach is allowed to act on the substance, the soluble sodium salt is converted into the insoluble free acid which will, therefore, not be absorbed. At best, however, the method of oral administration will almost certainly be less reliable than the method of intravenous administration because of differences in absorption exhibited by different people. In our own experience the intravenous method has given results which have been 93 per cent accurate when checked by the findings at operation, as compared with about 70 per cent of accuracy for the oral method. The procedure has proved itself of great diagnostic value even in the early and mild cases of cholecystitis in which the diagnosis by clinical means has always been uncertain. The technic of administration and the criteria of interpretation have already been extensively discussed in the publications of our own and of others, and I shall, therefore, not discuss them here. There is one point, however, which needs some discussion. Many of those who have written on this subject have expressed the opinion that the failure to obtain a shadow of the gall bladder

<sup>1</sup> I have personal knowledge of the fact that great care in the manufacture of the substance is being taken by the Mallinckrodt Chemical Works of St. Louis, the National Aniline and Chemical Co., of New York, and the Eastman Kodak Co., of Rochester, N. Y.

<sup>2</sup> Capsules with different coatings have been prepared for this purpose by the Swan Myers Co., of Indianapolis, and by the Lafayette Pharmacal Co., of Lafayette, Ind. Even plain gelatin capsules will sometimes prove satisfactory if they are small. Large capsules, on the other hand, will often not pass through the pylorus if the stomach contains no food, with the result that the gelatin is dissolved and the material is liberated into the stomach.

signified an obstruction of the cystic duct. This idea is not correct. It may signify that but it may also signify merely a failure on the part of the gall bladder to concentrate the substance or a failure on the part of the liver to secrete it into the bile. A gall bladder which fails to concentrate is necessarily pathologic. Failure on the part of the liver to secrete the substance into the bile is encountered only when there is a relatively enormous damage to the liver and therefore in conditions which are not only infrequent but also unlikely to be confused with any ordinary type of biliary disease. From a practical standpoint therefore the failure to obtain a shadow when the technic has been properly carried out signifies a pathologic condition of the gall bladder. Now in this case the salt was administered by the intravenous route and as you will see in the  $x$  ray films two stones are beautifully visualized in the gall bladder. These did not show in a plain  $x$  ray plate. In fact you will notice that actually the stones themselves do not show now but rather the gall bladder around the stones is visualized. In other words the stones appear as negative shadows or as filling defects in the gall bladder. Stones however even when present in the gall bladder are not always shown in the cholecystogram. More commonly a gall bladder which contains calculi has been sufficiently altered as to be unable to concentrate the material. For that reason therefore most gall bladders which contain stones are not visualized at all in the cholecystogram. Some stones however do not appear as negative shadows or filling defects but are seen with strongly contrasted outlines appearing on the photograph almost as if they had been retouched. We have generally found this phenomenon only in the case of soft stones and we have attributed it to an adsorption of the substance by the stone. Although all stones are not revealed by cholecystography many more are revealed by this method than by ordinary methods of  $x$  ray examination. Of course after all the diagnosis of the presence of stones is of little importance. It is of greater importance to know whether or not the gall bladder is diseased and it is in this respect that cholecystography has proved of the

most value. It is a means of determining function of the gall-bladder rather than the actual pathologic lesion

The next important consideration in the diagnosis is whether or not this patient's condition warrants an operation. Her urine is normal, her blood pressure is normal, the condition of the heart is good, and there is no icterus. It is felt, therefore, that she is a suitable case for operation.

**Later History.**—A laparotomy was performed. Two stones, as shown in the cholecystogram, were found in the gall-bladder, and a cholecystectomy was performed. The gall bladder was only slightly thickened and there were no adhesions. The appendix was also removed. The liver seemed relatively normal, but a microscopic examination of a small piece of it removed at operation revealed a chronic hepatitis of low grade as shown chiefly by periportal infiltration with round cells. The stomach and duodenum were normal. The pancreas showed no appreciable change. The pelvic organs were normal for a woman of her age. The postoperative course was uneventful.

#### CASE IV. X-RAY DIAGNOSIS OF GALL-STONES. ON CHOLECYSTOGRAPHIC EXAMINATION SHADOWS FOUND TO BE OUTSIDE OF GALL-BLADDER

This patient, like the last one, is presented to illustrate the advantages of cholecystography. He is a young man twenty years of age. He entered the hospital because he was told at an x-ray laboratory that he had gall-stones. He states that in February, 1925 he was operated on for the removal of a stone from the left side of a horseshoe kidney. There is now a discharging sinus in the operation scar. He has had, however, frequent attacks of pain on the right side, with frequent nausea and vomiting. These attacks, as he has described them, were not typical of renal colic, and there was some suspicion on the part of his physician that he had gall-stones. His urine at all times showed pus, but without a catheterization of the ureters it was uncertain whether the pus came only from the left ureter or both. When the ordinary x-ray examination revealed what were taken for gall stones (see Fig 507) the patient was advised





Fig 507—Case IV Ordinary x ray film showing shadows which were interpreted as probable gall stones

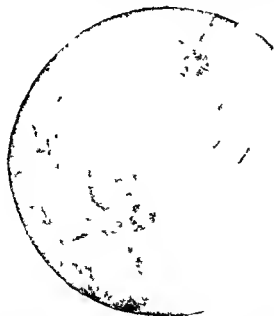


Fig 508—Case IV Cholecystogram, showing shadows to be outside of a normal gall bladder. They were actually renal calculi.

to have a laparotomy for that condition. After the intravenous injection of sodium tetraiodophenolphthalein however, it was plainly seen that the latter organ was normal. The patient was transferred to the genito urinary service of Dr. Caulk, who on catheterization of the ureters found pus coming from both ureters. Later at operation, he removed calculi from the left pelvis of the horseshoe kidney corresponding to the shadows which had been seen on the x ray film. With reference to this case it might with justice be said that pyelography would probably have disclosed the fact that the stones were in the kidney, but cholecystography is a much simpler procedure and one which is easier for the patient to bear than pyelography. Moreover it showed in this case that not only were the stones not in the gall bladder but also that that organ which had been suspected of being diseased was really normal.



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### PERSONAL OBSERVATIONS ON THE COURSE AND TREATMENT OF SIMPLE OSTEOMYELITIS OF THE JAWS

**Conservatism in Treatment.**—There is an Italian proverb which says, "He who goes slowly goes safely; he who goes safely goes surely."

The above can be taken as a safe guiding text in the treatment of simple osteomyelitis of the jaw bones. The general plan of good surgical treatment of simple purulent osteomyelitis was firmly established many years ago, and, except as influenced by the presence of the teeth, its treatment when affecting the jaws differs little from that of any other bone. Due partly to the superior resistance of the face and mouth tissues to most infections, and partly to the readiness with which spontaneous drainage is established around the teeth, in the jaw the disease has not the inherent fatal tendency that may characterize it elsewhere. On the other hand, the deformities that result, most commonly from ill-advised surgery, can be little short of ghastly.

The accepted treatment of osteomyelitis in general as handed down to the senior collaborator some thirty odd years ago consisted in, first, the early establishment of drainage of the focus with the least possible operative trauma; second, waiting until the virulence of the infection had subsided, the dead bone had spontaneously separated and sufficient new bone had been formed to maintain continuity before attempting any radical operation; third, at the proper time to remove all fragments of dead bone with limited damage to the granulations

lining their beds and where practicable to remove all edges of live bone that overhang the bed so that the soft tissue can drop into and fill these defects. The latter can often be facilitated by the fashioning of appropriate well nourished flaps of skin and subcutaneous tissue even muscle may be included.

When the above program is faithfully and intelligently carried out the disease will seldom prove fatal or progressive and successful sequestrectomy followed by permanent healing will usually be accomplished by one operation. When dealing with cavities in cancellous bone near joints the propriety of the latter part of the procedure may be questioned by some surgeons who are accustomed to filling such defects with Mostig's bone wax gauze or some other substance but there are comparatively few instances where a live flap cannot be advantageously substituted for these foreign fillers.

Many advantageous refinements of technic have been more recently worked out. Especially desirable are those that strive to raise the resistance of the tissues or to protect the granulation lined cavities from secondary infection or to sterilize them by non corrosive lotions but any radical departure from the basic principles just cited is apt to be followed by disaster or embarrassment in one form or another.

**Etiology—Osteomyelitis of the Jaw Bone**—If we are to consider prophylaxis against spreading septic infections within the jaw bones we must go into the etiology at least as far as portals of entry.

In the upper jaw the infection may apparently be by way of the nasal mucosa or antrum. (See Case Reports 1 and 2.) It can unquestionably be blood carried from a distance as is common in osteomyelitis in other bones but where infected teeth are present it may be difficult to draw absolute conclusions. Commonly in children the necrosis apparently follows the extraction of a tooth but in at least some of these the bone infection may have caused the symptoms for which the tooth was drawn. When the symptoms are first noted immediately after the treatment of a quiescent non vital tooth this rather suggests a pre existing periapical streptococcus infection which

may have been present for years. When such an infection involves a tooth with intact walls it must be considered as being of blood borne origin. In one child the necrosis followed an extraction during the acute stage of a fulminating infection, and we have had such a history in a few adult cases but it has been our observation that trouble following extractions under such conditions is more apt to result in diffuse infection of the soft parts or the death of the patient than an extensive necrosis of the bone.

While it is not safe to reach a *post hoc ergo propter hoc* conclusion in every or even the majority of cases it is, nevertheless all things considered a safe clinical bet that prevention of decay and injury of the teeth will prevent possibly quite a large percentage of these bone infections.

There may occur a low grade bone infection that forms little pus, more or less pain and a variable amount of swelling. It is apt to attack different parts of the same jaw or both jaws simultaneously or consecutively, throwing off a sliver of bone here or loosening a tooth there going on for a long time without coming to any definite conclusion or without showing any very definite head for surgical attack. The patient meanwhile may show various signs of intoxication. In this stage they may react badly to instrumentation. In several of these we believe we have given comfort to the patient and hastened the localization of the process by repeated doses of neosalvarsan. It was thought that these particular cases might represent a pus infection on a luetic base. Not all of these showed a positive Wassermann. (See Cases XI and XII.)

Treatment—Simple osteomyelitis of the upper jaw resembles the same affection in other cancellous bones in that it is of more rare occurrence and the necrotic areas are apt to be less extensive.

In either jaw the need for early artificial drainage of the locus is seldom urgent though confined or pocketing collections of pus should be liberated by internal or external incision when detected. It is maintained by many of the dental profession that the application of external heat in the early stages fosters

the formation of an external fistula. We have done the thing that has given the patient the greatest comfort, whether it has been the use of heat or cold.

On account of the free communication with the mouth that is present in necrosis of the body, it is impracticable to sterilize the cavities by irrigation and the injection of solutions into the fistulae soon after the infection has occurred is more apt to spread the process than to accomplish any good.

The very objectionable odor that is given off from some older cases of jaw necrosis we have found to be controlled by one or two thorough irrigations of all fistulae with a quantity of 1 per cent solution of formalin ( $2\frac{1}{2}$  per cent solution of the 40 per cent preparation of formalin) in water. The stinging pain of the injection does not last long but can be modified by a previous irrigation with 1 per cent novocain.

It is difficult to set an exact time but in the ordinary straight forward acute osteomyelitis of the jaw the dead bone will usually have separated itself in ninety days and by this time a strong involucrum will have formed that will permit the removal of the sequestrum without changing the normal contour of the jaw. It has been our observation that instrumental manipulation of the bone of at least the lower jaw, before the infection has lost its virulence, is very apt to be followed by further extension of the necrosis. In certain cases in which the periosteum has been stripped off or other attempts have been made to dislodge a piece of dead bone before it has become loose, we have found different segments in the same jaw that have been dead for different periods of time so that one piece may be loose, "worm eaten" and encased in a strong involucrum while a neighboring piece may have but recently died and not yet detached or if detached surrounded by so little new bone formation that after its removal the jaw may collapse at this segment or the bone may fail to regenerate. (See Case III.)

In some cases of extensive necrosis it may be very good surgery to divide the radical operation into several steps thoroughly cleaning out one area at a time. The surest way of cutting the necessary number of radical operations to the minimum is

to give a full three months between the original infection, or any subsequent instrumentation before attempting to remove the dead bone, and then, if it is not found to be "worm eaten" and surrounded by a definite bed of granulations, to wait another three months before making a subsequent attempt.

For other reasons it may be desirable to wait very much longer than three months before disturbing dead bone that is in close relation to developing teeth. Up to a very few years ago it was our practice to remove not only all loose "worm eaten" fragments of bone but all teeth and tooth buds that were definitely within the necrosed area on the theory that they must be dead and could act only as harbingers of infection. It was Dr Virgil Loeb of this city, who first called our attention to a case of which he had a very striking series of x rays. The first showed certain partially developed teeth to be very definitely surrounded by dead bone. Dr Loeb had not done a radical operation, but had waited for the dead fragments to be thrown off spontaneously, with the result that the tooth buds continued to develop, and the slightly deformed teeth had become fixed in the newly developed jaw bone as demonstrated by a later radiograph. Since then we have verified this result on several of our own patients, and it is now our custom in treating necrosis of the body of the jaw in a child to furnish drainage as indicated, watch closely for kidney damage, and, if the general condition permits, to do no radical operation on the alveolar portion but wait for the fragments to be thrown off spontaneously. Fortunately, in children in the tooth bearing areas the dead bone is not apt to become deeply sequestered as may happen in the ramus, but this does not hold true with adults. (See Case IV.) The preservation of the tooth buds is of tremendous advantage. In areas where they are completely lost the new bone is apt to be short to the extent of very serious deformity. (See Cases V and VI.) If one first or second molar is preserved it may save excessive retraction of the regenerated jaw, but preservation of the third molar bud will not do this. (See Cases VII and VIII and V and VI.)

Much more disastrous than the removal of tooth buds is



the complete lack of regeneration that may follow the too early removal of the dead bone or the attempt to control infection by resecting the original live bone (See Cases VI and IX) We know of one case in which the entire lower jaw is lacking from repeated attempts of this kind and there never has come under our notice a single instance of failure of regeneration of the mandible following a simple osteomyelitis that had not been subjected to early energetic bone surgery (See Case IX)

**Plan of Removal of Sequestra** —In the lower jaw the incision is made along the alveolar process, or as was necessary in Case IV an incision can be made on the skin surface along the lower border of the mandible and part way up the posterior border of the ramus from one side to the other For necrosis of the ramus in adults for locating dislodged spicules in the sigmoid notch the posterior part of the incision just described is most appropriate

After the sequestrum has been exposed slip a curet under the various fragments and ease them out the cutting edge turned toward the dead bone and not toward the involucrum This plan is usually sufficient even for a totally necrosed ramus and condyle When the sequestrum is buried in hard bone it may be necessary to chisel away one wall of the involucrum before the above can be carried out Where the pockets are multiple they must be dealt with individually but all may be cleared out at one operation A curet makes a most efficient persuader, and it should be used as a tractor an elevator, or as a tool to carve away *overhanging involucrum* but as a bone scraper only when hunting for hidden fistulæ that might lead to other sequestra Bone scraping as a habit is a pernicious practice, and is to be deplored even when necessary The search for small deeply buried spicules may be greatly facilitated by a preliminary injection of the fistula with methylene blue solution

In every case every piece of dead bone must be removed or so treated that it can be discharged spontaneously, otherwise the wound will not heal permanently It is for the lack of

such treatment that many cases remain unhealed for a period of years that otherwise might have been cured in a few months

In the upper jaw there is little tendency for bony sequestration of the fragments, but they are apt to become buried in scar and thus be the cause of persistent fistulæ. In seeking to remove such sequestra it is a better plan to dissect out the scar than to try to find the individual pieces of bone. This is sometimes true in regard to fragments in the neck that have worked down from the lower jaw (See Case X)

**Time for More Extensive Operation**—In all the preceding the emphasis has been on time consuming conservatism but when conditions become right for radical operation one should act boldly and efficiently. The necrosed alveolar process will be thrown off spontaneously or with very little help, but pieces of dead bone in the body or ramus will become encased by the living bone unless surgically removed and can remain indefinitely as a focus of infection (See Cases XIII, XIV, and XV). If, after the sequestrum has been removed, the pocket in the involucrum is very deep, surrounded possibly by overhanging walls, such a cavity may take years to scar over, and, therefore should not be left in this condition.

**Conservatism the Most General Choice**—The literature still shows the old division between those who advocate early conservatism versus those who promise to abort the disease by the earliest possible radical surgery. The position of the latter, who are still in the minority, is supported by neither new arguments nor any adequate number of convincing case reports.

#### CASE REPORTS

Cases considered in this paper do not include those primarily due to open injury to the bone, this rules out all open fractures.

The case reports are taken from cases seen since 1916 at Barnes Hospital, St. Louis Children's Hospital and St. Louis Mullanphy Hospital, because since that time the plan of recording histories has been more uniform.

The "follow up" of these cases has been made possible only by the co-operation and work of the Social Service Department

**Case I**—Girl two and a half years Infection of maxilla occurring most likely through antrum during course of diphtheria treated expectantly followed by recovery

During course of diphtheria swelling of right side of face occurred with later a discharge of pus Removal of loose pieces of bone from outer surface of maxilla five six and seven months later with entire recovery

**Case II**—Baby six and a half months Infection of maxilla and orbit probably of antral origin Early bony extension bony incision for drainage—death from pneumonia

Well nourished six and a half months old baby developed severe general symptoms of an infection and a swelling of the upper gum and hard palate which later extended to face and orbit Seven days later in an effort (probably ill advised) to obtain drainage entrance was made through the palate into orbit and antrum removing several infected tooth buds Nine days later the orbit was again entered and more pus obtained but the child died of pneumonia This is one of 2 cases in the whole series that terminated fatally and we feel that the child's chances of recovery were not helped by the early bone cutting operation (The other fatal case was one of phosphorus necrosis the patient also having had lymphatic leukemia)

Marx in 1920 called attention to the ocular lesions consecutive to osteomyelitis of the upper jaw in infants

Nord in 1924 again called attention to it and stated that the correct diagnosis was often missed He gave as treatment a conservative outlet for pus and waiting for spontaneous separation of the sequestrum with which plan we are in full accord

**Case III**—Boy five years Necrosis of the mandible which probably antedated tooth extraction bone cutting operation followed by a further spread of the necrosis too early removal of necrosed ramus followed by failure of regeneration of the ramus persistent fistula due to retained dead partially developed crown

Boy five years of age had two molar teeth on left side extracted on account of swelling of the face and a piece of loose



Fig 509—Case III



Fig 510—Case III

bone was removed from the gum in the clinic three days after the extraction. This suggests that the necrosis had antedated the tooth extraction by some considerable time. Three and a

half months later an operation was done that seems to have included raising some periosteum and cureting the involucrum. Eighty days after this last operation the face had again swelled and a very recently necrosed ramus was removed showing little destruction at the time of operation. This early removal of the ramus was not followed by regeneration.

Persistence of the fistulæ necessitated two further operations at one a dead tooth bud was removed from the ramus, and at the other a dead partially developed crown.

The whole course as viewed in retrospect suggests a case of low grade bone infection with slow separation of the dead fragments and that the infection was spread and new areas of necrosis occurred as the result of the attack on the live bone. The premature removal of the ramus fragment was in this case, only an incident but if a failure of regeneration had occurred in the body similar to that in the ramus it would have been a catastrophe requiring a subsequent bone-graft. There is some retraction of the jaw as a whole on the affected side as shown in the photographs (Fig 509 A and B).

Figure 510 is of an x ray taken June 16 1925 eight years and seven months after the last operation and at the age of thirteen years. The unerupted lower third molar is seen to be in proper relation to its opponent above and to the remaining part of the anterior border of the ramus. This would suggest that at least part of the retraction is due to shortening in the regenerated part of the body. It plainly shows the lack of the ramus and also shows a somewhat deformed third molar bud.

**Case IV**—Man thirty years. Extensive necrosis with multiple sequestra.

First seen three months after original trouble and found to have wide spread necrosis with between twenty and thirty pieces of sequestrum buried in separate pockets in the involucrum in the body and ramus (Fig 511). The operations were done over a period of time extending from seven and a half months to two and a half years after the onset of symptoms. There was recovery without diminution of the size of the man-

dibular arch, but all the teeth were lost. This case would tend to show that the long-delayed operation in adults would not save the teeth. However, the jaw is already developed and the



Fig 511—Case IV



Fig 512—Case V

saving of the teeth is not as important as it is where their presence is to be counted on to help preserve the length of the developing jaw.

**Case V**—Girl twenty years of age who had loss of all tooth buds at five years as a result of necrosis. The measurements made at the time of examination showed the body of the lower jaw to correspond to a normal jaw of about five years. We have observed other similar cases. A third molar is present but this has had no effect on the development of the jaw (Fig 512)



Fig 513—Case VI

**Case VI**—Man, twenty two years of age. Failure of regeneration of jaw after curetting operation on lower jaw for necrosis one month after a tooth infection



Fig 514—Case VI

Operation for necrosis at eight years of age. First seen at twenty two years. The third molars were the only teeth that had developed, with the resulting lack of development of mandible (Fig 513, A and B, showing deformity)

Figure 514, A and B, after cartilage and skin grafts to permit use of tooth carrying prosthesis. Prosthesis made by Dr. James A. Brown.

Case VII—Girl, ten years. Extensive necrosis of mandible following filling of a tooth. Sequestrectomy delayed eight months with preservation of some molar teeth that were in the necrosed area, and preservation of the normal length of the jaw bone.

Two weeks after the filling of a tooth the tissues over mandible swelled, first on right, then both sides, pain abscess opened and loose anterior teeth extracted two months later. Pus continued to drain and was first seen at the Washington University Dispensary two months after first symptoms.  $\alpha$  Ray condition at this time is shown in Fig. 515, A. It shows complete necrosis of the left side of body and ramus, the necrotic bone breaking into fragments, a fully erupted lower first premolar, and a partially erupted second premolar and second molar. New bone formation of the developing involucrem can be seen on the mental part of the body, but an attempt to remove the sequestra would have resulted in the loss of all associated teeth and most likely in a failure of development of new bone. Drainage had continued for five months when the child was sent into the St. Louis Children's Hospital to determine if the continuous suppuration had or was likely to cause kidney or other vital damage. Dr. Marriott advised that he thought it safe to continue without at present removing the sequestra.

Figure 515, B shows a well developed involucrem, and that the second premolar has either erupted further or is being thrown off. The developing crown of the third molar is also apparent. The masses of the sequestra are more clearly defined. It was in hopes of preserving some of the developing teeth that the sequestra were not removed at this time. The child was kept under careful observation, with repeated blood and urine examinations, three months longer. Eight months after first appearance of the symptoms Dr. Earl Padgett (then an associate in this service) removed the sequestra and rongueured away



overhanging bone. Child made a good recovery and the condition one and a half years later is shown in Fig 515, C. Both



A



B



C

Fig 515—Case VII

premolar teeth have been lost, but the second and third molars have continued to develop about normally. There is a good

strong body, but the only evidence of an alveolar process is about the second molar, which will be seen to be in approximately normal relation with its fellow above. The base of the third molar is situated a little farther back than normal, but this seems to be the rule in jaws that have been necrotic. On the report received as to present condition there was a question as to the possibility of a suppuration about one tooth, but there is no evidence of it in this radiograph. The important point is that the jaw seems to have continued to grow and is of approxi-



Fig 516—Case VII.

mately normal length, and with the normal molar occlusion preserved there is little likelihood of any marked facial deformity developing. Conditions on the right side about matched those of the left, but here the second molar was finally lost and the first premolar was preserved.

Figure 516, A and B. Photographs taken July 6, 1925. The scar can be taken care of by removing the involved area down to the bone, undermining the edges, and then suturing them together.

**Case VIII**—Boy twelve years Tightening of teeth that were loose in an infected jaw

x Ray three months after onset showed necrosis of right body back to second molar with the first molar rising out of its bed the cuspid two premolars and second molar in the necrotic area The final sequestrectomy in this case was done four and a half months later or eight months after the beginning of the trouble Six months later a report was received from the dentist that all the teeth mentioned were in place and tight except the first molar and also that a third molar had erupted

This case is similar to Case VII in demonstrating the possibility of saving teeth and jaw symmetry in children by waiting long enough to remove the sequestrum The reason for this is that the tooth bearing area in children does not sequestrate

**Case IX**—Woman thirty three years Lack of development following extraction of teeth and some unidentified bone operations

Operations done at age of twelve years following necrosis from extraction of a tooth When first seen at age of thirty three she had a little nubbin of bone in the neighborhood of the right glenoid fossa and all of the lower jaw on the left as far forward as the region of the cuspid tooth There was also some failure of development of the superficial tissues corresponding to the missing bone and she had several bad teeth which were pulled

Figure 517 A and B Showing deformity of jaw and lack of soft parts

Figure 518 A and B Appearance after skin and rib grafting and with prosthesis in place Prosthesis made by Dr James A Brown

**Case X**—Boy eight years Maxillary necrosis related to tooth infection repeated early operations failed to control symptoms

Necrosis of maxilla following tooth extraction During the next few months there were five operations on the bone in an



Fig 517—Case IX



Fig 518—Case IX

attempt to control the suppuration. Eight months after the first appearance of symptoms there was a discharging fistula under the outer part of the left lower eyelid in a scar attached to the infra orbital border. This scar mass was dissected out without identifying the sequestra and drainage established into upper fornix of the vestibule of the mouth. No bone fragments were found. skin incision closed with small drain in place. Child recovered with one mild return of symptoms about three months later. Report by letter eleven months later states child is well.

Case XI—Woman forty eight years. Antisyphilitic therapy and sequestrectomy after two years.

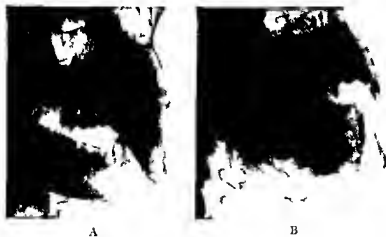


Fig. 519—Case XI

Gland enlargement under jaw. tooth pulled followed by persistent purulent discharge. Wassermann negative, only suggestion of syphilis. the otitis and two miscarriages without further pregnancies. Blood pressure over 200. Antisyphilitic treatment was given. Two years later partial sequestrectomy done. Six months after this there was still x-ray evidence of dead bone but there had been so much improvement that waiting longer was advised.

Patient died that same month—apoplexy.

Figure 519, A and B *x*-Rays taken seven months apart show a progressive bone involvement

Case XII—Man, forty eight years Wassermann negative, but some relief of symptoms of pain and infection by salvarsan therapy Sequestrectomy finally done

1919 Soreness and tenderness in all molars, and they loosened 1921 Molars pulled, three at a time and later that year fourteen more teeth pulled at one time Pain and discomfort continued, and in February 1922 it became very severe, and thick yellow pus drained into the mouth March, 1922 *x* ray showed "moth eaten" areas in all molar regions most marked on right The remaining teeth were loose and rough bone could be felt in the lower jaw Pain was a severe symptom throughout the course of the disease Diagnosis of necrosis was made with question of syphilis Several Wassermann tests were negative, but in November, 1922 there was reported marked improvement after antisyphilitic treatment of several months

A clean easy sequestrectomy was done several months later

Case XIII—Colored man twenty five years In 1909, at age of nine years, tooth broken in extraction, followed by pain and swelling There was one operation one year later He was treated for syphilis in 1924 First seen June 6, 1925 Left jaw swollen, poor occlusion, two sinuses present under jaw, and opening limited Incision made in front of ear, all tissues turned down, including parotid Dug out several pieces of dead bone, an impacted molar, and then the condyle and coronoid to give movement The mouth was still bound with a scar, which was cut through

Case XIV.—Woman, thirty two years Multiple extensive involvement of lower jaw with general symptoms that were not relieved until the last piece of dead bone was removed

She was in perfect health until dental trouble arose after some arsenic had been left in a tooth for two weeks There was local abscess and many teeth became loose Wide spread

necrosis (Fig 520 A) followed many teeth were extracted external drainage was done and several sequestrectomies. There was local neuralgia for which two nerve injections were done. There was also rheumatism, which cleared up, and there was a good general recovery after the last piece of dead bone was removed (Fig 520 B).

**Case XV**—Woman thirty four years. Following an inlay filling of right lower first molar pain continued and tooth was removed with excess trauma one month later. Pain and swelling for months many small pieces of bone were removed and jaws



Fig 520—Case XIV

locked for months after removal of teeth on that side. Symptoms continued over a year and a half. X-ray shown in Fig 521 A taken nineteen months after origin of symptoms shows a spanner shaped piece of dead bone lying in the substance of the body and lower part of ramus of the right mandible. The live bone embraces the sequestrum very closely. This considered with the length of time the symptoms had been present, and the lack of the mention of pus in connection with any of the various manifestations rather suggests an infection with an organism that is not prone to cause suppuration. Most likely a streptococcus of low virulence.

Through an incision along the lower part of the border of

the ramus and lower border of body the tissues superficial to the bone were raised and a subcortical sequestrum was laid bare and removed with a chisel. All granulations containing tunnels were converted into shallow grooves, and the soft tissues were sutured back into place with rubber-dam drainage.

Patient discharged from hospital four days later, and at no time from then until the second operation was she entirely free from pain, swelling, slight fever, or discharge, though the wound had been reopened, packed, and wet dressings maintained. An x-ray taken three and a half months after the first operation (Fig. 521, B) shows the channel from which the sequestrum had

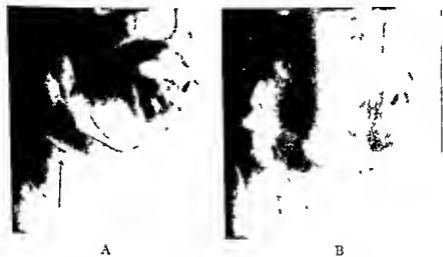


Fig 521—Case XV.

previously been removed, but no further evidence of necrosis or sequestra. Four months after the first operation the whole area was laid bare, revealing the channels filled with granulations, wound packed, and Dakin treatment maintained for some time. The packing was continued for two and a half months, and when the wound had healed the pain and low fever continued. Later the inferior dental nerve was injected with alcohol which for the time, at least, relieved the pain. No further observation of the case.

Case XVI.—Girl, one and a half years. Injury, abscess, removal of both condyles, recovery.



Fell down stairs no cut on chin but bled from nose and a lower incisor was knocked loose x Ray failed to show fracture Twenty days later pus drained from area of angles on both sides Forty five days later at operation showed an osteomyelitic process of both epiphysis of the mandible with complete separation of both condyles probably the result of an old frac



Fig 522—Case XVI

ture The whole condyle was removed from the left side and through and through drainage established on both sides with counteropenings above the zygoma Eight months after this another abscess was opened but no dead bone found Three years later she was seen and found free of trouble except for deformity as shown in Fig 522

## ANALYSIS OF CASES

Number of Cases 18 Children 22 Adults (12 Male 10 Female)

Cause	<i>Apparently associated with periodontal infections,</i> 33 31 of these were associated with extraction during acute state of a periodontal infection Of these 31 acute infections there were 2 following devitalization of the pulp with arsenic, and 1 following application of phenol to the pulp chamber 1 Associated with salivation HgCl 1 Associated with extraction of an old root  <i>Other causes than teeth 7</i> 1 Associated with gland enlargement and loosening of teeth 1 Following tonsillitis 1 Following measles 1 Following diphtheria 1 Associated with tuberculosis elsewhere in the body 1 Associated with upper respiratory infection in an infant 1 Phosphorus necrosis	
Jaws affected	Upper 8 Lower, 33 (Both jaws in one case of suspected syphilis)	
Wassermann	Negative No report Positive or partly positive	18 18 4
Salvarsan	8 Cases 3 With negative Wassermann improved 3 With negative Wassermann but no note of improvement 1 With positive Wassermann but no note of improvement 1 With positive Wassermann but treated before jaw was operated on (Two cases with positive Wassermann had HgCl-2 and K I treatment only)	

## ANALYSIS OF CASES (Continued)

Time elapsed between the appearance of first symptoms and the spontaneous throwing off, or the operative removal of sequestra in various cases	<p>1 at one week, bone cutting operation on upper jaw—death</p> <p>1 at three weeks spontaneous separation, upper jaw</p> <p>2 at one month</p> <p>2 at two months</p> <p>8 at three months</p> <p>7 at four months</p> <p>8 at five months</p> <p>8 at six months</p> <p>8 at seven months</p> <p>1 at eight months</p> <p>5 at nine months</p> <p>3 at ten months</p> <p>2 at eleven months</p> <p>1 at twelve months</p> <p>1 at seventeen months</p> <p>1 at twenty four months</p> <p>2 at thirty months</p> <p>1 at thirty four months</p> <p>1 at eleven years</p>
A total of 63 sequestrectomies 8 of which were spontaneous	
Number of operations	<p>25 cases—only one operation was necessary</p> <p>14 cases—multiple operations but about half of these were external drainages</p> <p>No operation on the case of phosphorus necrosis</p>
Deaths	<p>1 Baby, following a bone-cutting operation on the upper jaw one week after the onset of symptoms</p> <p>1 Man with phosphorus necrosis who also had lymphatic leukemia and pneumonia</p>

NOTE Cryer quotes Percy, of Paris in 1791 as having observed that teeth in the necrosed area of bone finally recovered their original solidity and were firmly implanted in the thickened gum. Necrosis following extraction was known as far back as Heister's time (1710), and he warned against extractions in inflammatory affections of the jaws.

## CLINIC OF DR FRED J TAUSSIG

BARNES HOSPITAL

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### QUESTIONABLE UTERINE CARCINOMA IN VERY YOUNG PERSONS

THE 2 patients I have to present to you today are typical of some of the puzzling problems we are sometimes called upon to face. In both instances we are compelled to choose between two courses, the one necessitating a radical surgical procedure certain to affect very seriously the happiness and future course of their life, the other involving delay with its increased risk of death from malignancy. Which course to pursue is bound to rack our hearts. To the man who considers solely the pathologic lesion it may seem a simple matter to say, "Take out the affected organ and you will be on the safe side." But to those who consider the patient as well and who realize what the removal of such an organ as the uterus in a young married woman will mean by depriving her of motherhood and rendering her prematurely aged, there will be reason to pause and question, "How certain are we that those cells which we see under the microscope are really indicative of a malignant disease?"

By a strange coincidence both of these patients are young married women, the one only nineteen years of age, the other twenty seven years old. It was also unusual that both were under my care for from four to seven years previous to the present time at a period when they were still unmarried and when the present condition had not as yet developed.

Let me recite briefly the record of the younger one of these two women. She is now nineteen years of age, having been married a little less than one year. As a girl of twelve years her mother brought her to me on account of profuse menstruation which had existed since its onset six months previously. Her

physical condition at that time was fairly good. The pelvic examination was negative, and after six hypodermics of corpus luteum extract she was greatly improved. Two years later, at the age of fourteen, she came back with the same symptoms. The findings were again negative, although she had more than the average amount of nervousness. Again corpus luteum was



Fig. 523—Case I. Glandular hypoplasia of uterine mucosa with marked inflammatory reaction.

given hypodermically, with favorable results. There was then a period of a little over three years, until March, 1924, that I did not see her. Again she returned with her old symptoms of menorrhagia. From March until December, 1924 repeated series of corpus luteum injections, given partly intravenously and partly subcutaneously, controlled the menstrual bleeding but little. Ergot in various forms was equally ineffective. On

December 12, 1924 a curetment was done and the scrapings examined. There was found a moderate glandular hyperplasia but no evidence of malignancy. The uterine cavity was normal in size. No indication of fibroids or other pelvic disease existed. The examination of the blood showed two and a half minutes clotting time, 3,700,000 red cells, and 80 per cent hemoglobin.



Fig 524 —Case 1. Area from uterine scrapings showing characteristics of adenocarcinoma (cell nests, pigmentation, polymorphous cell type mitosis). Patient nineteen years of age.

For two months the menstruation was normal, then the menorrhagia returned. Thyroid by mouth and antuitrin hypodermically gave practically no result, so that radiotherapy was finally decided upon, and four light x-ray treatments given in July, 1925. For two months thereafter the flow was normal. Then in September the bleeding returned, turning to so copious

a hemorrhage that on September 20th it necessitated an immediate transport of the patient to the hospital so that a second curetment could be done. It was thought at this time that the patient might be having an early abortion. The uterine cavity was found  $3\frac{1}{2}$  inches in depth and considerable tissue was scraped away from the region of the left uterine horn. The bleeding ceased promptly after the curetment.

Examination of the tissue removed at this time showed no decidual cells or fetal elements but to our surprise there was not only marked glandular hyperplasia but in certain areas a reduplication of the epithelium with irregularity in its shape, deeply staining nuclei and apparent breaking through of the basement membrane. Mitotic figures were found but not in great number. Considerable periglandular infiltration with round cells was present (Figs 523 and 524).

The sections were examined by several pathologists among them Prof. Leo Loeb of Washington University and Dr. M. T. Burrows of the Barnard Free Skin and Cancer Hospital who diagnosed adenocarcinoma.

At the present time one month since the curetment the bleeding has not returned, there is no discharge and examination of the pelvis shows a uterus of normal size with no palpable lesion in either adnexa.

You see the patient is apparently in excellent health, has a good color and is about 10 pounds above her average weight. She is extremely anxious to have children.

What shall be our advice?

We have decided for the present not to do a hysterectomy. Our reasons for this are threefold.

In the first place it is doubtful whether an absolutely certain diagnosis of malignancy can be made in this case. Microscopic cellular changes such as chromatin deposits, variations in size of cells, reduplication of epithelium, mitotic figures, etc. have their diagnostic significance. In some parts of the body these changes would have more positive significance than in the uterine corpus. As Cullen has shown in his book on Cancer of the Uterus (pp. 518-525) we may have in certain cases of

endometritis changes closely resembling those found in cancer of the body of the uterus. There may be knob like projections of layers of epithelial cells, round cell infiltration into the epithelial mass and some polymorphous tendency. Furthermore, it is conceivable that the x-ray treatments given in this case produced certain cellular changes in the uterine epithelium resembling those produced by carcinoma but that these cells will not prove to have the invasive and metastatic tendency of a true cancer. Finally, the youth of the patient (nineteen years) would speak against the diagnosis of a carcinoma of the body of the uterus. A careful search of the literature revealed but one case younger than this, a case reported by Von Hanseman,<sup>1</sup> of a girl of seventeen years of age. Notwithstanding these objections I do not see how, in view of the mitotic figures and breaking through of the basement layer, we can do other than make a tentative pathologic diagnosis of adenocarcinoma.

My second reason for not going ahead with a hysterectomy is a more cogent one. We have clinical proof as shown in the 22 cases compiled by Ladinski<sup>2</sup> that very early cancer of the uterine body can be removed by a thorough curetment. In some of these cases there is evidence that this simple removal resulted in a permanent cure. In the girl of seventeen years reported by Von Hanseman referred to above the microscopic examination of uterine scrapings showed carcinoma, hence a hysterectomy was done. Examination of the uterus revealed no trace of carcinoma anywhere although examined carefully in serial sections of the entire mucosa. In another case reported by Hess<sup>3</sup> in which the diagnosis of adenocarcinoma of the uterine body was made by Von Hanseman the patient, a woman of forty one years, refused to permit a hysterectomy after the curetment was done. Four years later no return of adenocarcinoma was noted.

A third reason for not advising a hysterectomy at the present time is that if the process were very malignant it would probably have scattered its elements to far distant sites, so that a simple hysterectomy would be of no avail. If, on the other hand, it were less malignant, its recurrence in the uterus



mucosa could be detected at an early date by a second diagnostic curetment. If this showed positive adenocarcinoma a hysterectomy could still be done with strong likelihood of permanent relief.

It is our plan, therefore, in the course of the next three weeks to do such a diagnostic curetment regardless of whether the symptoms of bleeding return or not. If at this time micro-



Fig. 525—Case II Showing hemorrhagic exudate covering area of adenomatous proliferation in the cervix

scopic examination of the scrapings showed no evidence of malignancy, I would feel justified in still further delaying radical measures. Of course under all circumstances the patient must be kept under close observation for the next few years.

The history of the second patient can be related more briefly. She came to me in February, 1921, complaining of an annoying vaginal discharge and dysmenorrhea. At this time she was unmarried and twenty four years of age. Examination showed

no pelvic lesion. General hygienic treatment combined with injections of corpus luteum gave only slight relief. She did not return until four and a half years later (August, 1925), six weeks after her marriage. Her chief symptoms as before were leukorrhea and painful menstruation. Examination revealed a cervix three times the normal size, irregularly nodular, but soft. A



Fig 526.—Case II. High-power microphotograph of broken squamous cell nests covering a portion of the adenomatous tumor of the cervix. Note the irregular size and arrangement of the cells, deeply stained nuclei, and round-cell infiltration

copious glairy mucoid discharge without admixture with pus filled the vagina. On specular examination the cervix was seen as a red, smooth, polypoid mass that did not bleed readily and was not at all friable. A piece was removed for microscopic examination and showed no evidence of malignancy, but so marked a hyperplasia that the term "adenoma" could properly be applied (Fig. 525). A few attempts to shrink up the mass

with the electrocautery were of no avail, hence an amputation of the hypertrophic cervix together with a curetment was done September 7, 1925. All the pieces were saved and carefully examined microscopically. At one point in the tissue removed, as shown in Fig 526, the surface of the polyp was covered with a broken layer of squamous epithelium, showing deeply staining nuclei and some mitotic figures. As elsewhere in the sections there is marked round cell infiltration. Whether these changes indicate an early malignancy or whether they were due to a reaction of the epithelium following the use of the electrocautery is difficult to say. The change was noted only at one point.

In view of the complete removal by amputation of the adenomatous area and the questionableness of the diagnosis of malignancy, I feel justified in recommending in her case further observation at regular intervals before deciding on a hysterectomy. Yet I confess to far greater uneasiness in her case than in that of the fundus carcinoma. I have asked her to report to me at regular intervals of not over two weeks and at the slightest indication of trouble about the cervix I shall insist upon a complete hysterectomy. Cancer of the cervix is very apt to extend beyond the limits of the uterus at an early stage, especially in younger individuals, so much so that the remark has frequently been made by gynecologists that they have never seen a permanent cure of cancer of the cervix in a woman under thirty years of age. Whether this pessimistic view should further incline us to conservatism in this case is, however, debatable. If I felt sure we were dealing with cancer I would give her a fighting chance by the most radical measures of extirpation and radiotherapy that the case permitted.

A word more as to the age of these patients in relation to uterine cancer. Cancer of the uterine body, as you may know, is essentially a disease of old age. The greatest incidence is between fifty to sixty years. Cullen,<sup>4</sup> in his series from Johns Hopkins, had but one case as young as thirty years and none younger. Looking through the literature I find but 3 cases under twenty five years, one by Engelhorn<sup>5</sup> at twenty three

years of age, one by Reipen<sup>6</sup> at twenty years, and the one already cited by Von Hanseman at seventeen years

In cervical cancer the lowest age limit is much less. Ganghofer<sup>7</sup> found it in a girl eight years old, Schauta<sup>8</sup> at seventeen years, and Fraenkel<sup>9</sup> at nineteen years. Between twenty to thirty years numerous cases are on record.

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## CLINIC OF DR. MALVERN B. CLOPTON

CHILDREN'S HOSPITAL

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### OSTEOMYELITIS

THE first case is a hoy who, at the age of fourteen, had osteomyelitis of the upper ends of both tibiae. He was recover-



Fig 527—Case I. Acute osteomyelitis of the tibia, ten days after infection, when bone changes are first detected.



Fig. 528—Case I Six weeks after infection showing mottled appearance of bone in stage of healing when bone absorption is greatest.

ing from a sore throat when both knees began to pain and swell. He was quite sick, had a temperature around  $104^{\circ}$  F., and for several days was treated for rheumatism. On the third day

the tenderness of the joints was most marked over the tibial sides and when tested by light tapping this tenderness was seen to extend down the shafts of the tibiae about a third of their length but there was no tenderness over the femurs. x Ray pictures at this time showed no bone change. The operations on both legs were the same. An incision was made along the upper end of the tibia and a channel cut into the metaphysis



Fig 529—Case I Ten weeks after infect on showing Carrel tube in bone cavity. New bone is replacing absorbed tissues.



Fig 530—Case I Eight months after infection. Bone healed.

exposing the center of the bone for about  $\frac{1}{4}$  inches releasing a small amount of thin pus from which was cultivated a *Staphylococcus albus*. At this time we had a report from the blood culture showing that it contained the same organisms. The pain was relieved, but the temperature still remained high gradually receding for ten weeks to normal. The left knee-joint continued swollen and on aspiration yielded a cloudy

fluid from which no organism could be grown. The x ray study (Figs 527, 528) showed a progressive mottling of the bone shadow of the medulla and thickening of the periosteum that extended as far as the middle of the bone. The wound was treated with Dakin's fluid through Carrel tubes inserted into the depth of the bone trough (Fig 529). After about two months the bone reaction reached its height and small sequestra or bone sand began to be discharged. A few small spicules came away for a long time, but, eventually, a new bone structure replaced the original infected tissue (Fig 530) and the child at the end of two years was as well as ever, playing the most active games without the slightest inconvenience. This is a case of a severe infection treated early, with good restitution of bone and a relatively short disability.

The second case is this boy who came to the hospital in 1918 one year and a half after trouble had started with his left leg which the doctor said was a "boil that ran into blood poisoning". More abscesses appeared on the same leg lower down and also one over the left shoulder. The diagnosis was apparently not made until after the fourth month when three pieces of dead bone were discharged. The shoulder infection, which was due to an osteomyelitis of the humerus was opened by an incision that was sufficient to release the underlying trouble and the bone healed. Although several "risings" were opened along the tibia infection, the osteomyelitis continued to progress and the dead bone of the leg had been gradually working to the surface. The condition on admission is shown in Figs 531 and 532, a poorly nourished boy with a cellulitis of the leg with numerous discharging sinuses and a wide opening below the knee in which a large necrotic bone appears. This case had progressed so far that a strong involucrem had formed and a sequestrum of most of the shaft had completely separated. After the removal of this large piece of dead bone through a channel in the new shaft the cavity of the involucrem filled up rapidly under the cleansing influence of Dakin's fluid. In two months the leg had completely healed.



with a new bone that has replaced the original tibia (Fig. 533). The boy has had no trouble since and his leg and arm are now as good as their opposite fellow.

This case was neglected in the beginning, but natural repair had made so much progress that sequestrectomy was all that was necessary, the involucrum forming a new and strong shaft



Fig. 531 —Case II Osteomyelitis of tibia Condition on admission eighteen months after onset Sequestrum appears in wound

The third case is a boy still in the hospital, who gives a history going back over a year. When he was first conscious of any trouble the right hip felt sore when he lay on it or bumped it. After a few days' rest from walking or playing it would get well. About a month ago he had a repetition of the trouble that had bothered him four or five times during the year, but *this time he didn't get relief from rest*, and he was brought to the Children's Hospital, where he was found to lump a bit. All

the motions at the hip were perfect, there was tenderness and some swelling below the great trochanter, and his temperature was about 101° F. x-Ray plates showed an involvement of the medulla of the femur for about 2 inches below the trochanter, with very little periosteal reaction and no sequestra. On incising



Fig 532—Case II Osteomyelitis of tibia eighteen months after onset showing sequestrum of whole shaft and strong involucrum



Fig 533—Case II Two months after sequestrectomy Shaft formed by involucrum Skin wound healed

the periosteum, we found a blood tinged mucoid exudate, which lay over a soft denuded cortex. When this was incised a dry bone-marrow was exposed which contained no pus, but cultures showed *Staphylococcus aureus*. This is the rare form of chronic non-purulent osteomyelitis, which has been designated by Ollier as "osteomyelitis albuminosa." The pain was relieved by the

incision and the child is showing a good progress toward healing. The cavity was not extensively drained, only punctured in several places.

Osteomyelitis should be looked upon as a manifestation of a blood borne or general infection which makes its greatest lesions in the bone. The blood infection that accounts for osteomyelitis nearly always has its origin in the nasopharynx or it may originate from boils or infected cuts or abrasions or from the urinary tract. In 9 out of 10 cases the infection is due to the staphylococcus group but all staphylococcus blood infections do not give us osteomyelitis. Our experience makes us believe that certain staphylococci have a predilection for bone and these organisms when once distributed by the blood to all the tissue disappear generally but continue to live and involve the bones. We can reproduce osteomyelitis in young rabbits by a very small intravenous injection of staphylococci, preferably from a culture from a case of osteomyelitis. The resistance to infection of this nature is developed in all the tissues of the body liver spleen, bone marrow etc. but in the vigorously growing parts of the bone where the bacteria lodge they may find less resistance and live longer. Consequently we are inclined to Lexer's theory that the organisms lie in the small vessels and capillary loops which are found at the metaphysis (that part of the shaft next to the epiphyseal line). Here the mechanical condition offers the best chance for lodgment as there is a physiologic hyperemia with a slowing of the blood stream which favors the retention of bacteria and the organism can multiply and begin an acute suppuration. If we recall the places where there is the most active growth of bone we will name in order the upper end of the tibia the lower end of the femur the lower end of the tibia and the upper end of the humerus and it is at these locations where we most frequently find osteomyelitis beginning. Osteomyelitis is almost never seen in the epiphyses but is a disease of the shaft beginning near the epiphyseal line in marked contrast to tuberculosis which practically always starts in the epiphysis. A primary involvement of the shaft of the bone with tuberculosis is a

curiosity in this country; only 4 such cases out of many hundreds of bone infections have been seen at the Children's Hospital.

The course of the infection in the bone largely depends on the virulence of the organism. During the invasive period, when the disease is still a picture of a generalized infection, there may be almost no localizing symptoms. If the intoxication is great, the local manifestation may be overlooked, and in the severest infections death may come before bone lesions



FIG 534 —Osteomyelitis of the neck and shaft of the femur, with the head of the bone intact, considered to be tuberculosis before admission

are manifest. In less severe cases the lesions in the bones will develop with signs and symptoms that can usually be spotted early if we are on the look out for them, but one is constantly struck with the number of cases admitted to the hospital with a diagnosis of rheumatism, sprains, typhoid fever, or tuberculosis of the bone (Fig 534) that are clearly osteomyelitis.

The picture in the first case is typical—sore throat, with fever, and at the same time pain developed in the knee or just below it. The severe gnawing, throbbing pain was thought to

be rheumatism but when the knee was felt there was no fulness of the joint and above the patella there was no tenderness. The pain did not respond to drugs the fever got higher and if the bone hadn't been opened a swelling would have appeared below the knee where a redness had commenced.

What happened in the bone and surrounding tissues? About the time that the blood stream had picked up its staphylococcus infection from the throat there had been a group of these organisms lodged in the slowed blood stream of the capillary system in the metaphysis of the tibia just below the upper epiphyseal line. Infection of the immature bone cells had begun and with it the breaking down of the fine trabeculae that form the bone structure. The spread of the disease in the bone along the length of the medullary canal may extend until the whole shaft is involved or it may cease at any point but at the same time there is a lateral extension of the infection toward the periphery of the cancellous bone of the metaphysis that will soon carry the infection through the very thin cortex near the epiphyseal line when it becomes subperiosteal and as the periosteum is invaded the infection can break through it and reach tissues toward the surface of the limb to become subcutaneous and clearly manifest. At times however the infection breaks through the thin cortex and meets a periosteum that is so resistant that it strips from the shaft rather than perforates and in this way as the products of inflammation inside and outside of the bone increase the periosteum is further lifted enclosing a pus pocket over a denuded shaft which is then deprived of that part of its blood that usually comes through the periosteum. With the progress of the destruction inside the medulla the blood supply from the branches of the nutrient artery is cut off by thrombosis of these vessels and we then have death or necrosis of the whole shaft which lies in a bag of pus retained by the stripped periosteum.

We have followed the acute phase of the infection in which period we see a fair proportion of cases. Fortunately the proportion gets larger as the knowledge of the disease increases but most of our hospital cases come to us so late that bone

destruction is accompanied by repair and the picture is more complicated, and often irreparable damage and deformity is found. One of the most notable changes in most cases is the thickening of the shaft of the bone by new bone laid down under the periosteum. This begins immediately after the medullary infection starts and is found on a shaft not only directly overlying the most obvious medullary infection but extends far beyond, on what is apparently healthy bone. In time this layer of new bone becomes so firm that it can assume the burden of the involved shaft, and is known as the involucrum. If any of the bone dies, these pieces of dead bone are called sequestra. Large sequestra of the shaft must be removed *in toto* before healing will take place, small sequestra or bone sand may be absorbed and give no further trouble.

The disease is usually seen in the most active growing period, from the age of six to twelve years. In half of the cases we have found more than one bone involved, but in such cases the appearance of these lesions is not simultaneous, and there may be a long interval after the first lesion, before the second or third lesions are noticed. We believe that the infection reaches all the bones at the same time, but activity and destruction does not come in some foci until much later, in some cases there is an interval of months or years before the lesion bothers. In a few cases we have seen subsequent lesions follow one another so rapidly that for a time one despairs of any of the bones escaping. Pain is the best evidence of the activity of a beginning focus and tenderness follows shortly. The later lesions are rarely as destructive as the initial lesions. No bones can be said to be immune. We went for years without seeing a vertebral body invaded when a late lesion appeared in the spine of a child that had appeared to have recovered from an infection of the upper end of the femur. We had never seen a scapular involvement until last winter, when we had 2 cases of involvement of the spines of the scapula along with other bones in boys otherwise robust.

The severity of the general and local symptoms will depend on the virulence of the organisms and the resistance of the

patient. Cases of osteomyelitis may develop as a result of injury and appear at points not usually looked for. However, we are inclined to believe that the history of sprain, which so frequently is given in these cases means that the lesion was first felt when the limb was used, rather than that the use or abuse was responsible for the lesion.

The diagnosis of the disease from x ray plates taken in the later stage of the disease will be easier if we remember that osteomyelitis is a disease of the shaft of the long bones. Tuberculosis of the bone begins in nearly all cases in the epiphysis. Syphilis of the bone may involve the shaft, or be epiphyseal but if it involves the shaft it rarely gives sequestra, and the new bone formed under the periosteum is usually rather irregularly laid down and gives a fuzzy appearance while the characteristic new periosteal bone of osteomyelitis is regularly lamellated giving straight lines on the plate. There is a rare form of tuberculosis of the shaft of the bone seen only occasionally in these parts but quite commonly in Scotland, that either builds a dense reaction about a central lesion, or a thin lace like shell in the rarefying type that can be easily recognized when once pointed out.

The treatment of acute osteomyelitis is directed to the immediate drainage of the infected bone. Some surgeons are content to incise through the periosteum but we go into the bone and drain the medulla either by using a small drill and making as many holes as will give release to the impounded infection, or by means of a narrow bladed bone cutter we remove a channel of bone  $\frac{1}{8}$  or  $\frac{1}{4}$  inch in width beginning close to the epiphysis and cutting along the shaft until the extent of the lesion is reached. But in no instance should we clean out the infected medulla as we depend on it to reproduce the new bone. We never use a curet in the acute stage to scrape away bone tissue as it is this practice that gave us the unhealing bone cavities of the former days.

The adequate drainage of an infected shaft together with the use of the Carrel Dakin treatment to keep the wound clean, not to disinfect the deep tissues gives us earlier healing and

less deformity. During the healing we must protect the limb to avoid fracture or deformity. If the epiphyscal line has not been destroyed, the limb will about equal its mate in length and certainly in strength. In old cases, where there is sequestrum formation, these pieces of bone if large, must be removed by careful manipulation, and we attempt to preserve all the new bone that has developed. It is surprising how strong a small spicule of new bone gets if we remove a large piece of dead bone that has long lain next it and kept up a constant irritation.





